MAY 1951

# INDUSTRY AND POWER

For Executives and Engineers Responsible For The Economical Plant Service

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***THE SAVINGS WILL PAY FOR THE EXTRA TRAPS!***

**SAVES 14 TONS COAL MONTHLY...** that's the profitable result of changing over to Armstrong Traps . . . *M. Wile and Company, Buffalo, N. Y.*

**2-3 HOURS FASTER HEAT-UP...** starch drier takes new lease on life after Armstrong Unit Trapping... *Industrial Grain Products, Ltd., Fort Williams, Ontario*

**40° TEMPERATURE RISE...** pyrometer readings on flatwork ironer rolls prove performance of Armstrng Unit Trapping . . . *Peter Bent Brigham Hospital, Boston, Mass.*

IT IS false economy to drain more than one coil, kettle, unit heater or other steam-consuming unit with a single trap. In the first place a single trap for several units must be larger and higher priced than the individual trap on *each* unit, so the difference in original cost is not as great as it might first appear. But the difference in performance can be *tremendous.* The slightest difference in condensing rate between two units will cause a difference in steam pressures between the units. Even a few ounces pressure difference will hamper drainage of condensate and, most important, will prevent or retard flow of air from the lower pressure unit. The result is widely varying and subnormal temperatures, less heat output, slower heat-up, less production and higher operating costs.

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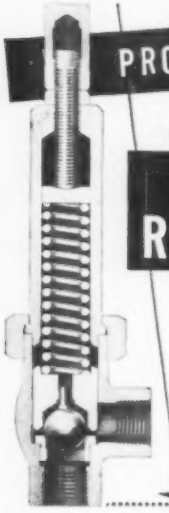

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*against abnormal pressure increases with*

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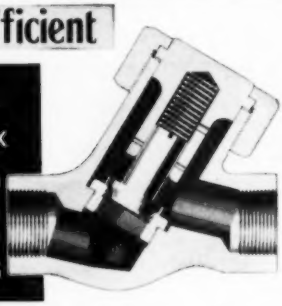

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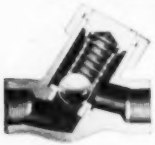

Union or bolted bonnet in sizes ¼ in. to 2 in. inclusive in two pressure classes —600 lb at 850 F and 1500 lb at 850 F. For complete information, write for Catalog 104.

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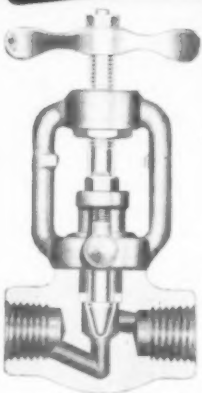

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# INDUSTRY AND POWER

*The Magazine for Engineered Plant Services*

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***Cover Illustration***

Scene at Cities Service refinery at East Chicago, Ind., after completion of $18,500,000 modernization program. New fluid catalytic cracker and delayed coking plant were added, while additions were made to steam generating plant and water supply facilities. Four-color plates for illustration—courtesy of Cities Service Company.

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# Acorns of Science

**Developments not yet available, but of interest to those who are responsible for The Engineered Plant Services**

### Synthetic Mica

● Independence from natural sources of mica seems assured by developments at the Electrotechnical Laboratory. Results on 100 different compounds indicate a fluorine containing phlogopite mica to be most promising for growing large sheet crystals. Solution of such practical problems as construction of silicon carbide crucibles and furnace design are within reach, allowing emphasis on conditions for optimum mica crystalization.

Of special interest is experimental development of a hot-pressed, polygranular mica ceramic material. It can be worked to accurate dimensions, is chemically stable and has high weathering resistance and good dielectrics.

### Like Melted Butter

● A pipe line, built in Texas and reported by the American Petroleum Institute, is unusual but could make sense in many applications. For handling very viscous crude oil, the carrier has a 2 in. flow line jacketed by 4 in. pipe in which hot water is circulated. The whole is insulated with magnesia.

### Bamboo Reinforces Concrete

● Also from the Department of Commerce comes a report on substitution of bamboo for steel in reinforced concrete. Although further research is recommended, successful building projects have been completed and principles developed on the selection of culms (stalks), waterproofing, placement, and for design loads.

### Air Cushions Shock

● In a new container, instruments, chemicals or explosives, held between membranes which are sealed to the edges of two interlocking outer shells, are protected from shock and atmospheric damage. Air pressure between shell and membrane can be controlled for any degree of support or cushioning. Shells may be metal, paper or plastic; cast or stamped. Clear plastic allows reading of instruments without removing from container.

### Shooting Bacteria

● Plant engineers in the food and drug industries may soon be called upon to service big guns for small game. Following work in preserving fresh foods, a pharmaceutical company is investigating microsecond surges of electron beams for sterilizing drugs—especially those that are heat sensitive—after packaging. A king-size vacuum tube is used, but the high voltage generator only 7 ft high is small for such equipment.

### Fast-Writing Oscilloscope

● Using a hydrogen thyratron to generate sweep rates up to 200 in. per micro-second, or more than 17 million ft per sec, the Naval Research Laboratory has demonstrated an oscilloscope that will be valuable in observing and photographing millimicrosecond electrical transients. A billionth of a second isn't long, but only a few years ago a microinch seemed relatively insignificant.

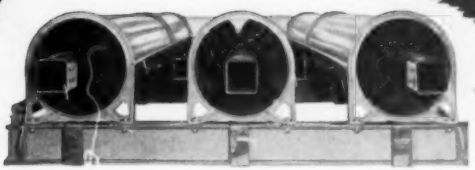
### This Is Fast Too

● Literature describing experimental work on small steel rotors reports that rotational speeds up to 800,000 revolutions per *second* have been attained. Rotors with diameters of approximately .01 in. were magnetically suspended. Centrifugal fields generated were about one-half billion times gravity. Seems like rotors would disintegrate until one remembers that mass decreases with cube of the diameter; restraining area only as the first power.

### Simplified UHF Transmission

● Developments that may make ultra-high-frequency waves more popular for uses such as carriers is noted in a Department of Commerce report. Nonradiating cylindrical surface waves can be guided on a solid wire coated with a dielectric. Other surface modifications, such as threading, may be used. Special horn-shaped signal launching devices are necessary. Efficiencies are better than for coaxial cables or rigid wave guides which are now used.

# REQUIREMENTS FOR A SET OF GENERATOR LEADS



### ELECTRICALLY, THEY MUST

- carry the output with but one conductor per phase.
- not exceed a reasonable temperature rise.
- withstand overload without harmful effect to the conductor or its insulation.
- have a tight cover to prevent short circuiting by dust, moisture, etc., on the creepage surfaces of the insulators.
- have a minimum of bolted connections in bus run.
- protect against phase-to-phase short circuits.
- have insulation which is not harmed by heat or age.

### MECHANICALLY, THEY MUST

- provide for expansion of bus and cover due to heat.
- withstand vibration.
- be adaptable to installation in congested areas.
- withstand thermal and mechanical stresses without damage or operating failure.
- employ porcelain and metals to their best advantage.

### WHEN INSTALLED, THEY MUST

- present an attractive appearance.
- be easily put in place.

### FOR INSPECTION AND MAINTENANCE, THEY MUST

- be easily accessible, permitting quick replacement of parts, particularly insulators.
- withstand periodic high-potential tests without damage to insulation.
- protect personnel who may come in contact with bus enclosure.

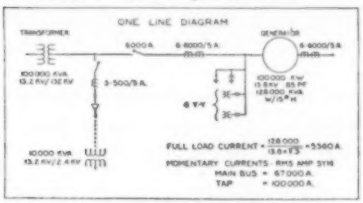
### FOR ASSOCIATED EQUIPMENT, THEY MUST

- make provision for mounting disconnecting switches, instrument transformers, and protective devices.

## I-T-E ISOLATED PHASE BUS MEETS ALL THESE REQUIREMENTS!

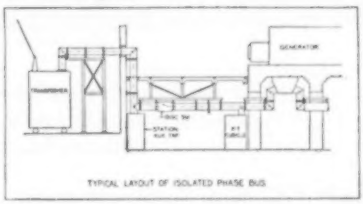
*And it's as easy as this* to order!

**1.** Give us a one-line diagram, like this —




**2.** Plus pertinent information about your building, generator, and transformers.

**3.** We will quote —




**4.** And then build *your* Isolated Phase Bus.

*For further information, see your local I-T-E Representative, or write*

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First Perfect Spread Stoker Installation to generate 55,000 lbs. of steam per hour per boiler.

## Day and night, for weeks at a time, Spreader Stoker continuously releases 700,000 B.T.U. per hour per square foot of active grate area

1 IN THE FALL of 1949 a very well known corporation installed three AE Perfect Spread Stokers to generate 55,000 lbs. of steam per hour each in one of its midwest plants.

2 Months later the Company needed more steam from larger boilers in another plant where the existing stokers had been designed to burn 12,300 B.T.U. per pound coal. Over the years, however, the available coal dropped to as low as 9500 B.T.U. per pound so the plant could not carry the required load.

On the basis of proved performance, an AE Perfect Spread Stoker was installed as a replacement...and here's the record:

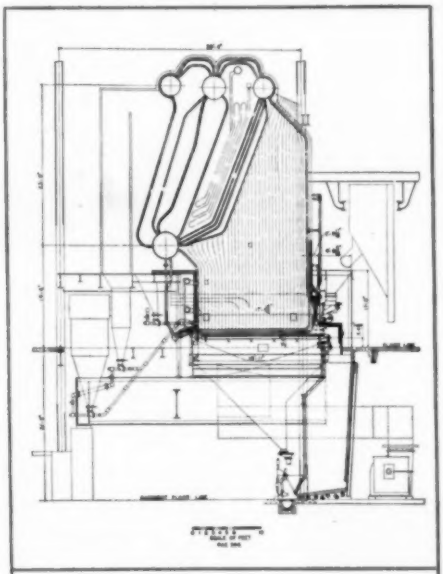
The Perfect Spread has averaged better than 180,000 lbs. of steam per hour—24 hours a day—7 days a week for weeks on end. Efficiency is about 84% and the release rate exceeds 700,000 B.T.U. per sq. ft. of active grate area per hour! In terms of sustained results per sq. ft. of grate surface this is probably the highest duty spreader stoker installation in the world. With an increased manufacturing load they now find they can carry 200,000 lbs. per hour.

3 And now, again on the basis of performance, the same company has ordered two more duplicate Perfect Spread Stokers.*

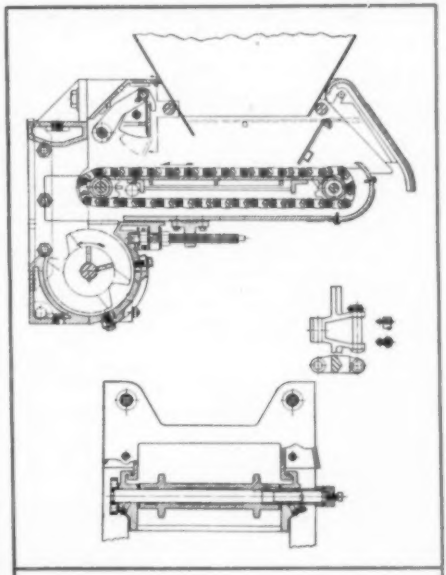
AE Perfect Spread Stokers burn high and low ash coals with practically equal efficiency. They assure positive, continuous coal feed and unbe-

*AS THIS MESSAGE WAS GOING TO PRESS, THE ABOVE COMPANY PLACED A FOURTH ORDER FOR A PERFECT SPREAD STOKER.

# PERFECT SPREAD STOKERS



Second larger installation of Perfect Spread Stoker actually giving 200,000 lbs. of steam per hour from a single boiler.



NON-CLOGGING CONVEYOR FEEDER: Coal enters feeder from hopper, and is conveyed positively, continuously and uniformly forward. Coal is not fed in slugs.

lieveably even distribution. *They never clog on wet coal.*

Perfect Spread Stokers have a capacity range from 8,000 to 500,000 lbs. of steam per hour... coal feeders are adjustable from 50 lbs. to 7500 lbs. of coal per hour. Mail coupon today for a copy of the Perfect Spread Stoker booklet and for a reprint of a new report on large spreader stokers. Also, if you are now considering a boiler in capacities from 300,000 to 500,000 lbs. of steam per hour, let's arrange to get together and discuss cross-firing.

**WON'T CLOG ON WET COAL**

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AE Products are: Taylor and Perfect Spread Stokers, Marine Deck Auxiliaries, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers.

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Gentlemen: Kindly send me free copy of Perfect Spread Stoker booklet and new stoker report ☐. I should like to discuss cross-firing ☐.

Name_____ Title_____

Company_____

Address_____

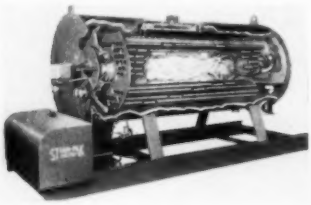
City_____ Zone____ State____

# new equipment and developments

**You can easily get more data on these new equipment and development items. Use the handy, postage-free order cards on Page 117. Just list the key numbers of the descriptive paragraphs in the spaces provided on the card and mail**

## 1—COMBUSTION CHAMBER HAS SWIRL FLAME

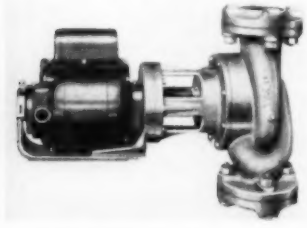
York-Shipley, Inc., manufacturers of Steam-Pak packaged steam generators, using gas, oil or combination of gas and oil, has just announced its 1951 combustion chamber design features for all models—15 to 250 hp. In these models the flame swirls in a circular, faster motion through the entire combustion chamber, providing greater heat absorption with higher heat transfer. This action is created by blowing swirling excess air into the chamber around the burner. Flow of gases through the boiler is greater resulting in increased heat absorption and



at the same time a protective circle of preheated air is formed around the flame, tucking in loose flames that otherwise would tend to impinge and burn out the carborundum combustion chamber. At the center of the combustion chamber is located a factory-adjusted carborundum ring, which regulates the length of the circulating flame by squeezing it and drawing excess air into the center. This flame action produces complete combustion of all gases before they reach the bank of tubes. Higher combustion efficiency with maximum heat transfer and more efficient boiler output has resulted.

## 2—PUMP CIRCULATES HOT WATER

Taco Heaters, Inc. has just designed a pumping unit primarily for forced circulation hot water heating systems in large buildings. They are ideal for equipment requiring the volumes within their capacities. The units come in three sizes ranging from 15 to 167 gpm and can operate against 5 to 29 ft heads. It can be installed in six positions, and the mechanical seals require no grease or stuffing boxes. The unit is easy to service as the seals can be replaced on job with only an open end wrench, Allen setscrew wrench and a screwdriver. The impeller is cast, is dynamically balanced and has a double inlet. The impeller shaft is stainless steel, hardened and super-finished for long uninterrupted service. Three inch flanges are on all sizes with recessed holes to prevent the bolt head from turning. Four bolts are required.



## 3—pH INSTRUMENT IS PORTABLE

A pocked-size pH meter and companion probe unit is now available from Analytical Instruments, Inc., that permits instant, on-the-spot pH determinations. Completely self-contained with batteries this instrument

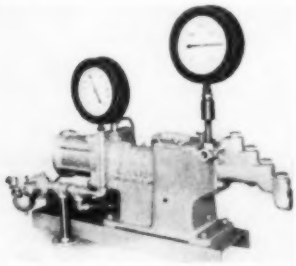
is furnished, camera fashion, in an ever-ready case with novel plastic tubes of buffer and KCl solutions. The meter is scaled from 2 to 12 pH for easy reading, and a simple adjustment gives readings from 0 to 14. Accuracy of 0.1 pH is obtainable. Hearing-aid type batteries provide up to 1300 hr of operation. The electrometer tube, switch and input connector are sealed in a single unit to ensure freedom from high humidity difficulties. The one-knob control and continuous reading features of this instrument simplify operation.

## 4—SAFETY DEVICE FOR OIL BURNERS

Electronic combustion safeguard system for commercial oil burners, that provides immediate cut-off of fuel in case of failure, has been announced by General Electric's Control Div. Listed by Underwriters Laboratories, Inc., and approved by Factory Mutual Laboratories, the co-ordinated equipment includes a switch-amplifier-contactor unit, phototube holder and electrode holder. The system assures positive protection against combustion failure because (1) when the gas pilot does not ignite the oil valve cannot open and (2) when the oil does not ignite the supply of fuel is cut off. After the cut-off, the motor continues to operate for 30 sec to purge the nozzle or cup of unburned fuel to prevent carbonizing, which reduces field servicing. The system is then locked against further operation until manually reset.

## 5—PRESSURE GENERATOR HAS WIDE PRESSURE RANGE

The Milton Roy Co. has just developed a generator for a broad field of hydrostatic applications. The unit is combined with a group of specially designed simplified controls to develop pressures up to 25,000 psi, using ordinary plant air supply in the pump cylinder. Each of the pumps develops a discharge pressure ratio range of at least 6 to



1, permitting single pump use for applications requiring various pressures. It can be used in the hydrostatic testing of boilers, tubing, pipes and piping systems, pressure gages, valves, vacuum pumps, dryers, and high pressure hose. It has applications as a booster pump for maintaining required pressures in hydraulic systems. Capacities range from 4 to 405 gph and pressures from 25 to 25,000 psi.

## 6—AIR VIBRATOR HAS MANY USES

Spo, Inc., has announced the development and availability of a heavy-duty air

***( Continued on page 12 )***

# NEW JENKINS VALVES for Safety and Economy in L.P.G. Services

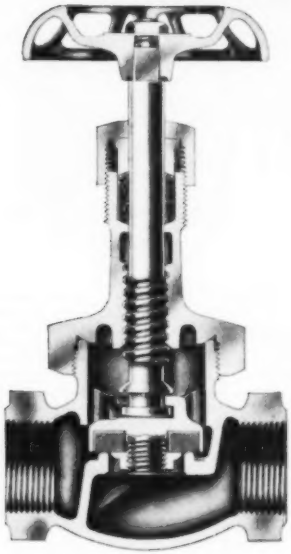


Fig. 506 Bronze Globe
400 lbs. O.W.G. ¼" to 2"

Fig. 507 Bronze Check
400 lbs. O.W.G. ¼" to 2"

Fig. 508 Bronze Angle
400 lbs. O.W.G. ¼" to 2"

**APPROVED BY UNDERWRITERS' LABORATORIES,**

## SPECIAL DESIGN FEATURES

**provide high strength and trouble-free, tight closure to meet all tests**

**EXTRA HEAVY, REINFORCED BODY.** Liberally proportioned construction, with reinforcing rib along center line, and heavy lug ends. Will take all ordinary pipe strains without distortion, and provides a factor of safety far above any L.P.G. service needs.

**CROWNED SEAT** Insures positive tightness required to meet N.B.F.U. test of 500 p.s.i. under seat when valve is closed.

**IMPROVED COMPOSITION DISC** Meets every test of L.P.G. service. Retains resilience through entire range of liquid and gaseous phases from −50 F. to +150 F.

**DEEPER PACKING BOX.** Extra deep packing box and spiral, lubricated packing material permits spindle to turn with minimum friction. Dependable seal at this point and at valve seat is assured without excessive effort on handwheel.

**BEVELED SPINDLE SHOULDER** Back seats against corresponding bevel at bottom of bonnet when valve is full open. Relieves pressure on packing material.

**ALL OTHER PARTS SPECIALLY DESIGNED** and proportioned to meet rigorous requirements of critical L.P.G. service. Construction features of Fig. 507 Check and Fig. 508 Angle same as Fig. 506 Globe.

**Sold Through Leading Distributors Everywhere**

**Liquified Petroleum Gas** (butane-propane), commonly known as "bottle gas", has become a popular domestic fuel, and is now being widely used in industry. Piping systems for handling these gases must be controlled by valves specially designed for this hazardous service.

These new Underwriters' Approved Jenkins Valves for L.P.G. service offer strength and safety well beyond specified requirements. They are built to the same quality standards that make all Jenkins Valves the economy-wise choice for any service.

Where Gate Valves are required for L.P.G. service, Jenkins Fig. 270-U offers the proper ratings.

Because of their superior safety features, Jenkins L.P.G. Valves are also recommended for air, gasoline, oil, and similar services where exceptionally rugged, specially tested valves are needed. For complete details and dimensions, get the new Jenkins L.P.G. Valve folder, Form 197. Use the coupon. Jenkins Bros., 100 Park Ave., New York 17, N. Y.

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros.

The complete line of JENKINS L.P.G. VALVES are described in this new folder. Mail coupon today.

**JENKINS BROS., 100 PARK AVE., NEW YORK 17**

Please send L.P.G. Folder—Form 197

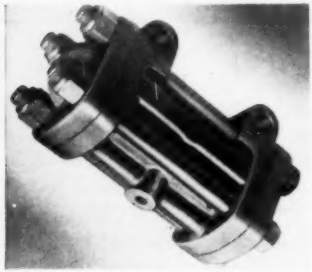
Name.....

Company.....

Address.....

*( Continued from page 10 )*

vibrator designed for a wide range of applications. It can be mounted parallel to the longitudinal direction of material flow to assure positive "in-line" transmission of sand, coal, ore, slag, grain and chips as well as other powdered or granular materials. In addition, this heavy-duty vibrator can be



operated in horizontal or vertical position with equal efficiency. It features a cast semi-steel body, alloy-steel ribbed ends and four alloy-steel connecting bolts. Units operate on standard 80 psi line pressure. The Series 80 SPO air vibrator can be furnished to take either a ⅛ or ¼ in. straight or ell-type hose fitting in either steel or brass.

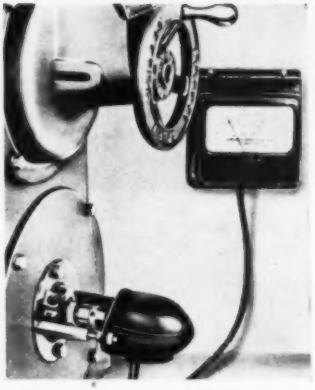
## 7—ROOF VENTILATOR POWER DRIVEN

Ilg Electric Ventilating Co. has announced a power roof ventilator that comes in eleven sizes, each size available in two to four different speeds. The unit, consisting of a housed direct-connected centrifugal fan and motor, features positive controlled

ventilation independent of wind or weather conditions. A weather-tight housing contains the fan unit and air control accessories, eliminating the need of an expensive high-profile curbing and fitting of air control accessories into the roof or curbing section. The ventilator is easily and quickly installed, wired and serviced.

## 8—ELECTRONIC TACHOMETER FOR VARIABLE DRIVES

Reeves Pulley Co. now has an inexpensive electronic tachometer for use with their variable speed transmissions and electronic

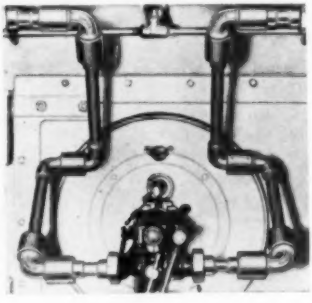


variable speed motor drives, when they must be mounted in inaccessible or remote locations. This tachometer is comparable in price to the previously offered mechanical type and is more accurate. It operates on the a-c generator principle and allows more flexibility in installation, since the indicator may be mounted as far as 300 ft from the variable speed drive. Designed especially for quick and easy installation on Reeves variable speed drives, in capacities from ¼ to 87 hp, already in service. For most installations, no alteration of any existing parts will be necessary.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

## 9—BURNER CONNECTION FOR 1000 PSI SERVICE

Rasmussen Mfg. Co. is now manufacturing a high-temperature ball bearing swivel fitting for use in making up the pipe connections to boiler burners. The free-turning swivels are packed with deformable asbestos, which is unaffected by temperature of the product being burned or by the reflected heat from the boiler. Each swivel is thoroughly lubricated at the time of assembly and no further lubrication maintenance is required. Working pressures up to 1000 psi and temperatures to 750 F are easily handled. The swivel connections are available in single, double and triple swings, each fitting rotating freely a full 360 deg. Each swivel rotates on a double row of ball bearings between hardened and ground steel wear plates.



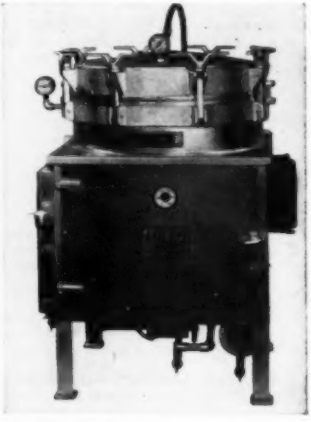
## 10—SMALL OVEN PROVIDES OPERATIONAL DATA

A small, gas-fired baking oven for general purposes made by The Carlson Co. proves especially useful for (1) baking or tempering small lots of metal products, (2) for heating samples, so that when large orders are heated at the same temperature in

large ovens, the results will be the same and (3) for use in shops for research, testing, precipitation hardening of beryllium-copper and other alloys, relieving hydrogen-embrittlement, drying cores, baking molds and plastics, and for many similar uses. Outside dimensions are 14 in. wide, 16 in. deep and 20 in. high. Heating chamber is 10 in. wide, 9 in. high and 12 in. deep with 2 shelves. Capacity is 250 to 650 F. Pyrometer actuated controller, 3 in. dial thermometer, two 60 min. timers and 2 in. of insulation are other features. Net weight 75 lb.

## 11—OIL RECLAIMER COMES COMPLETE

Hilliard Corp. has announced a line of oil reclaimers that features rotary type pumps, high capacity regenerative heat exchanger, vacuum pump lubricating system and general re-arrangement for ease of servicing and longer equipment life. They are used extensively for the reclamation of diesel and gas engine compressor lube oils. The proc-



ess consists of filtering the oil through a bed of fuller's earth for straight-run miner-

*( Continued on page 16 )*

Yarway Type "B" Seatless Blow-Off Valve shown in closed position.

# WHAT?

# NO SEAT?

● That's right! In this Yarway Blow-Off Valve there is no seat to score, wear, clog and leak.

The unique balanced sliding plunger design eliminates a common cause of blow-down valve trouble—the seat. Many boiler shut-downs are saved . . . power interruptions avoided . . . production speeded.

Latest metallurgical improvements also make Yarway the ideal blow-off valve for difficult service where acid washing is used.

Yarway Seatless Blow-Off Valves are available singly or in tandem combinations for all pressures up to 1500 psi. For higher pressures up to 2500 psi, specify Yarway Stellite-seat valves.

For the latest information on blow-off valves, get Yarway's newest catalog—B-424 for pressures to 400 psi, B-433 for higher pressures.

**YARNALL-WARING COMPANY**
109 Mermaid Avenue, Philadelphia 18, Pa.
*Branch Offices in Principal Cities*

# YARWAY

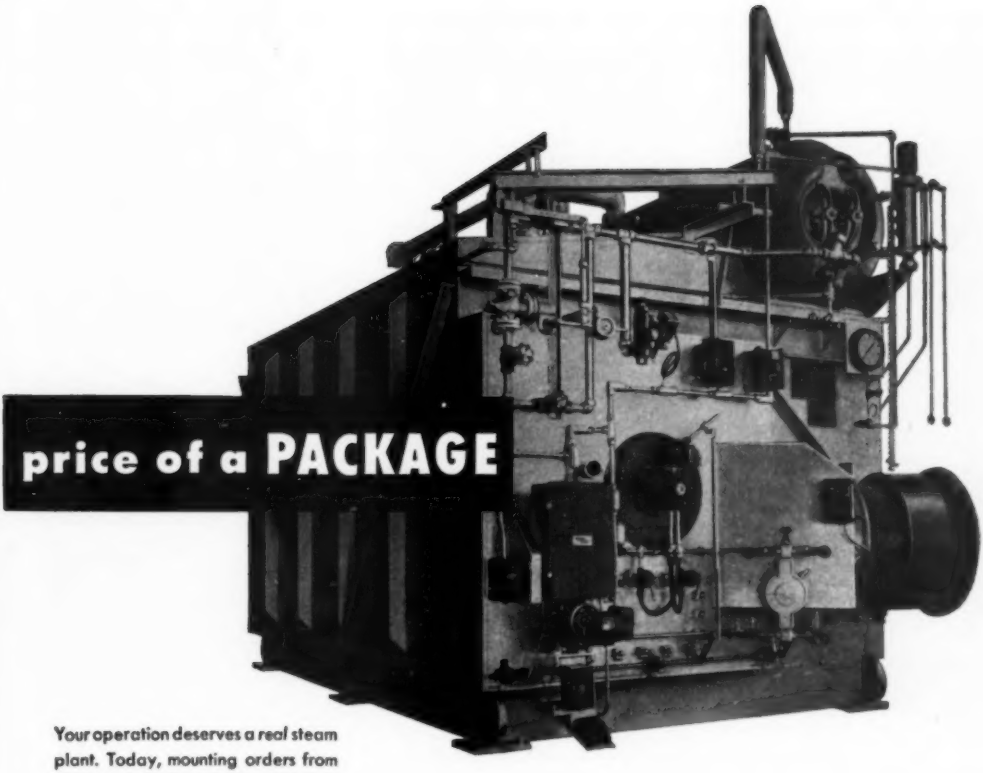
## BLOW-OFF VALVES

***STOP BLOW-DOWN TROUBLES—KEEP BOILERS ON THE***

## *Combined features that distinguish Foster Wheeler package steam generators*

| | |
|---|---|
| WATER TUBE DESIGN | Vertical tubes,...steady water level, closely spaced waterwall tubes on 3½" centers |
| FACTORY ASSEMBLED STEAM PLANT | Compact, self-contained steam generating units |
| WIDE RANGE OF CAPACITIES | 7,500 to 30,000 lb per hr . . . flexible multi-unit installations for greater capacities |
| HIGH STEAM TEMPERATURES | Provisions for superheaters in some designs |
| PORTABILITY | May be transported by common carrier . . . minimizes problems of initial installation and plant relocation |
| EXPERIENCE | 50 years' design, engineering, manufacturing of power plant equipment behind each Foster Wheeler unit |
| EASILY INSTALLED | Simple foundations . . . few service connections |
| OUTDOOR INSTALLATION | Rugged, steel encased construction |
| ACCESSIBILITY | For inspection,...cleaning, maintenance |
| COMBUSTION CONTROLS | Fully or semi-automatic controls for single or multi-unit installations |
| CONTROL VALVES | Equipped with 3-valve by-passes |
| CLEAN HEATING SURFACES | Soot blowers incorporated . . . cleaning without boiler shutdown |
| HEAT LOSS MINIMIZED | Minimum heat loss—from radiation and air infiltration |
| RAPID LOAD SWINGS | Large diameter drums and ample furnace heating surface |

**all for the**



**price of a PACKAGE**

Your operation deserves a *real* steam plant. Today, mounting orders from large and small companies alike testify to the fact that Foster Wheeler Package Steam Generators are supplying industry's answer to the need for a compact, highly efficient source of steam. These units assure economy in the cost of steam production and high availability. They are easily installed and adapted to various fuel and firing arrangements. The Foster Wheeler Package Steam Generator presents a relatively inexpensive way to modernize your plant.

FOSTER WHEELER

For further information, write FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW YORK 6, N. Y.

*( Continued from page 12 )*

al oils or filter discs for heavy-duty detergent type oils. After filtering, the oil flows into a vaporizer where all traces of water, moisture and fuel dilution are removed. The oil passes through a high capacity regenerative heat exchanger where it is heated. Vapors resulting from the condensation of water and fuel dilution pass to a distillate receiving tank. Operation is continuous and automatic. Available in capacities ranging from 2 to 200 gph.

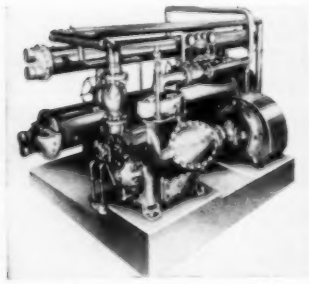
## 12—TUBING FIN AIDS HEAT TRANSFER

Development of a two-fluid-pass heat transfer surface in the form of concentric tubing with radial fins is announced by the Industrial Div. of Modine Mfg. Co. This tubing possesses characteristics that adapt it to many uses such as gas liquefaction, condensing, exhaust heat recovery and heating requirements involving viscous materials.

It can be fabricated of copper, steel, stainless steel, nickel and other metals in lengths up to 20 ft. Intimate contact is accomplished by means of fusion bonding of fin and tube elements. Tubing may be equipped with simple "T" end fittings to provide easy connection to both passes and can be conveniently arranged in series parallel banks. Because of its specialized character, the tubing is engineered to meet the individual application and is currently offered only in large quantities.

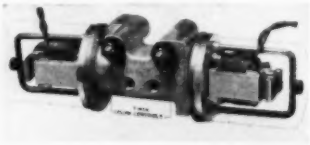
## 13—CONDENSING UNIT COMES AS PACKAGE

Two models of reciprocating refrigeration machines specifically designed for air conditioning and refrigeration use in the 100 to 150 hp range are announced by Carrier Corp. Designated as Carrier 30B it is furnished as a complete package with compressor, cooler, condenser, inter-connecting piping, fittings, safety and capacity controls, gage board and cooler and condenser stands. Careful pre-engineering has assured precise matching of components for maximum operating efficiency and economy. Unusual compactness of assembly, provided through special design of pipes and fittings, reduces pressure loss to the minimum, guarantees better overall performance and permits a wide range of applications where space is critical. The machine is particularly suitable for chilling water and is readily adaptable to many industrial requirements, including direct product cooling, brine chilling, ammonia and chlorine condensing.



## 14—SOLENOID VALVE HAS DOUBLE ACTION

Corrosion resistant double operated solenoid valves for air and low pressure hydraulic cylinders are now being manufactured by Airmatic Valve, Inc. This model, called DDS-4-375, is for operation of double acting air and low pressure hydraulic



cylinders where pressure must be held on one side of the cylinder for a given period of time. The valve may be reversed by momentarily energizing a single solenoid, and the cylinder may be held in position without the necessity of holding either solenoid energized. Power failure will not reverse the valve or cylinder. Only moving part is a one-piece stainless steel spool, which carries an "O" ring type seal. The valve may be base-mounted or pipe mounted directly to the body. Available in ¼, ⅜ and ½ in. full orifice area in two styles.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

## 15—DEVICE MAKES WIRE SPRINGS

Cycloid Corp. now has a device that converts an ordinary tool shop drill-press into an efficient spring-making machine. It literally makes a drill press a spring factory. Wire, from 8 (0.020) to 28 gage (0.071), can be employed. Outside diameter of finished springs can be made to vary from 3/16 to ⅝ in. Special dimensions can be made by special spindles. The pitch of compression springs may be infinitely varied while the machine is running. A recent test of 3/8 in. O D close wound 0.040 dia piano wire was turned into spring at the rate of 650 fph. The length of the spring to be made is governed only by the length of the wire.

## 16—CONTROL CENTERS ARE BUILT-UP

Ward Leonard Electric Co. announces the development of a control center designed for accommodating any system up to 600 v, using components not larger than NEMA size 5. Primary applications are for refrig-

eration and air conditioning systems, industrial plant machinery, generating plant auxiliaries and similar installations where a group of motors can be independently or interdependently controlled from a central location. It applies the "building block" principle to motor control. Prefabricated units containing control for a single motor are assembled and wired into a free standing steel enclosure section. Any number of sections may then be bolted and bussed together to form a control center. Built to AIEE and NEMA standards it includes two standard size sections, 76 or 90 in. high, 20 in. wide and 20 in. deep.

## 17—THREE-WAY VALVE OPERATES AT 2000 PSI

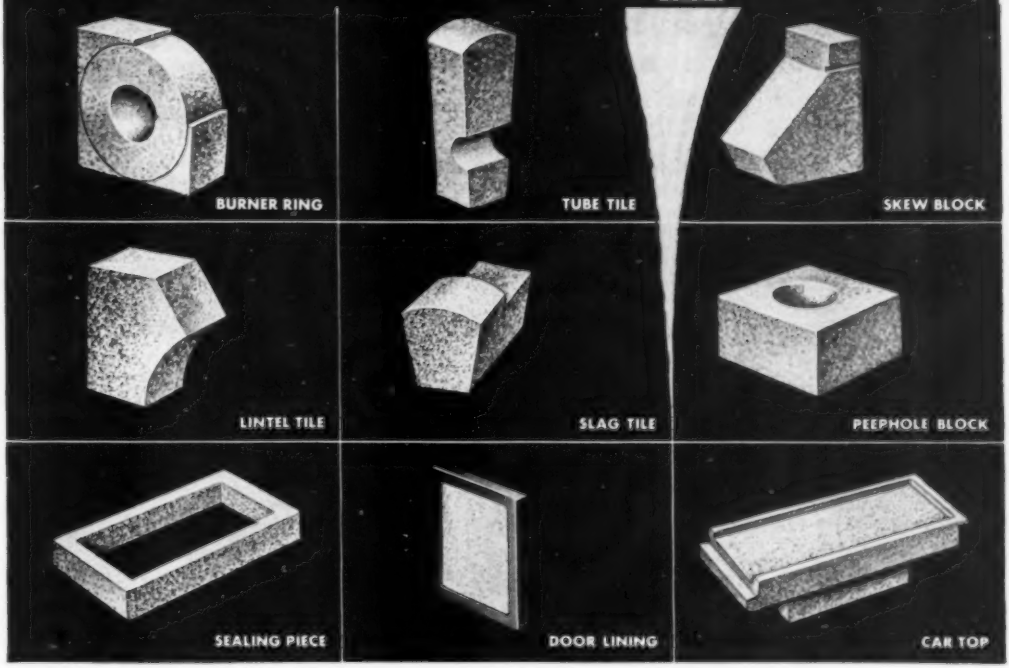
A hydraulic control valve—designed for a long, trouble-free service life—is announced by The Parker Appliance Co. It is an open center, single spool, three-way valve that operates at pressures up to 2000 psi and features an externally adjustable, built-in, balanced relief valve sized to handle full pump capacity up to 14 gpm. Pressure drop through the open center of the valve is held to only 10.25 psi at 14 gpm, imposing the minimum load on an engine-

mounted hydraulic pump and little loss in engine power while the valve is in the neutral or holding position. Cylinder and pressure ports are available in ¼, ⅜ or ½ in.

*( Continued on page 18 )*

# *Versatile* **B&W KAOCAST** *eliminates expensive delays*

## WHAT SPECIAL REFRACTORY SHAPES DO YOU NEED QUICKLY?




Special shapes are never special problems if you have B&W Kaocast on hand! With this truly unique, versatile 3000F Refractory Castable they can be molded quickly and easily, *by you, when you need them.* Kaocast can be cast directly in place or applied by cement gun. No expensive inventory is needed for car tops, burner tile, peephole blocks, baffles, bridge walls, door linings, arches, piers and scores of other refractory shapes. You get fast repairs, at less cost.

Kaocast stays on the job, too. It offers high resistance to spalling and slag attack. It has low volume change on initial firing and negligible reheat shrinkage. Thus Kaocast increases furnace availability and decreases production costs.

*Put B&W Kaocast to work in your plant. This money saving refractory is another product of B&W's 30 years of specialized refractories engineering. Consult your B&W Refractories Engineer, or write for Bulletin R-22.*

**BABCOCK & WILCOX**

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 85 LIBERTY ST., NEW YORK 6, N.Y.
WORKS: AUGUSTA, GA.

R-397

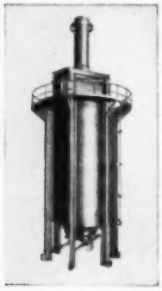
**B&W REFRACTORIES PRODUCTS — B&W 80 Firebrick • B&W Junior Firebrick • B&W 80 Glass Tank Blocks • B&W Insulating Firebrick B&W Refractory Castables, Plastics and Mortars • OTHER B&W PRODUCTS—Stationary & Marine Boilers and Component Equipment... Chemical Recovery Units . . . Seamless & Welded Tubes . . . Pulverizers . . . Fuel Burning Equipment . . . Pressure Vessels . . . Alloy Castings**

*( Continued from page 16 )*

internal pipe thread size, while the return port is sized at ¾ in. It is constructed of pressure-proof castings and hardened steel moving parts. Piston seals are of the standard lip type.

## 18—DIRECT FIRED HEATERS FOR INDIRECT HEATING

Struthers Wells Corp. have announced a standard line of direct fired heaters with capacities of 100,000 to 15,000,000 Btu per hr. This equipment is designed for a wide range of applications, including indirect circulation heating using heat transfer



mediums such as Dowtherm, and for direct heating of vapors and liquids. Temperatures range to 750 F or above. Complete automatic control systems are available that largely eliminate operating attention. Operating costs may be comparable with those for steam boilers in smaller sizes. Completely engineered systems including all necessary equipment are available if required.

## 19—GLASS GAGE HAS NON-FROSTING FEATURE

Jerguson Gage & Valve Co. announces non-frosting large chamber gages—series RLF-10 (reflex) or series TLF (transparent)—that include a patented glass extension, which prevents frost from forming

over the vision slot. It is particularly adapted to the gaging of low temperature, light, gaseous fluids that tend to boil or surge because of the larger area at the meniscus. Application of this model is for low temperature ammonia, freon, propane, ethylene and other services where low temperature fluids must be gaged. Readings are made easily with materially increased accuracy. In installation, the entire gage may be covered with insulation, leaving only the outer surfaces of the window extension exposed.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

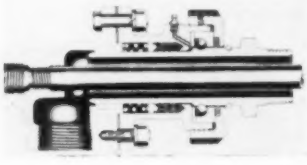
## 20—JUNCTION BOXES ARE WEATHERPROOF

Weatherproof junction boxes made of non-corrosive, cast aluminum are announced by the Stone Mfg. Co. that include a variety of covers and fittings for universal use on almost any outdoor wiring or light-

ing job. The box has four hubs tapped ¼ in. IPS and is provided with or without mounting lugs. It has a flat aluminum cover plate sealed with a heavy cork gasket and a separate cast aluminum cover tapped to take standard lamp holders for the 150, 200 and 300 w outdoor weatherproof bulbs.

## 21—PIPE CONNECTION HAS REVOLVING JOINT

A compact, improved type of revolving joint for use in making piping connections to drum type dryers, rolls, calendars, and other rotating equipment is announced by Barco Mfg. Co. Designated as Type IBR, the joint is characterized by extremely low torque and can handle steam, oil, air, water, gas and chemicals. Rotating portion of the joint consists of a special precision machined and heat treated steel tube, which screws into the hub of the drum or roll. The non-rotating portion is ball bearing mounted on this tube. Built for 150 psi steam or 200 psi hydraulic, and also for vacuum service. They are recommended for temperatures up to 450 F, depending on packing specified. Standard sizes range from ½ to 2 in.



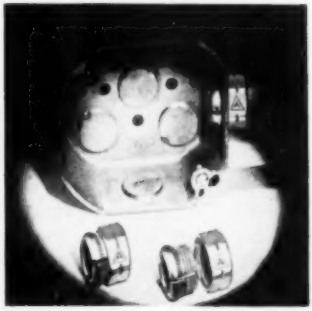
## 22—ELECTRONIC RECORDER HAS TWO PENS

A 2-pen electronic recorder announced by Leeds & Northrup Co., records two functions simultaneously against time. The instrument saves tedious compilation and

point-by-point plotting of data. Since both functions are drawn as continuous curves on a 9-7/8 in. wide chart users can follow swift-changing variables with ease. Two separate electronically-amplified measuring circuits, two balancing motors and two recording pens are all housed in one standard case. Circuits can be supplied to work with thermocouples, strain gages, tachometers, thermal converters, pH cells or most other types of primary elements. The instrument can operate controls or alarms.

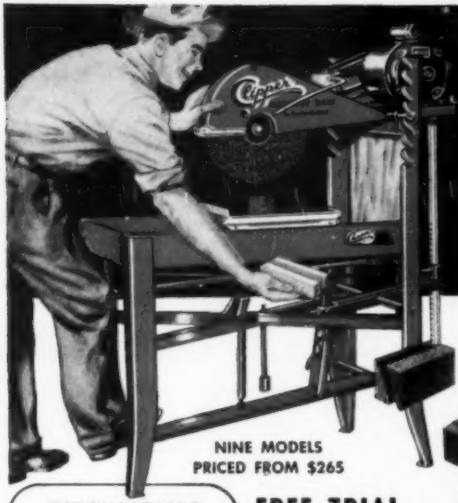
## 23—THINWALL CONNECTOR EASILY INSTALLED

Lower cost, faster installation and increased wiring room are advantages built into a two piece connector for ½, ¾ or 1 in. thinwall conduit offered by Appleton



Electric Co. Requiring no locknut, this connector tightens with a single wrench and is Underwriters' approved for inside work

*( Continued on page 22 )*




NINE MODELS
PRICED FROM $265

# LOOK JOE !...
# Make These Cuts with a CLIPPER...Let's Stop "DOWN-TIME" Delays!

*Any* **SPECIAL SHAPES** *SKEWS, SPLITS, ANGLES, SOAPS*

**CUT IN SECONDS with a *DUSTLESS* CLIPPER MASONRY SAW**

• Any of the special shapes needed in your Furnaces, Kilns and Boilers can be salvaged from "culls" or sliced with ease from "standard" refractory shapes.

**PERFECTLY SMOOTH CUTS ELIMINATE HIDDEN FRACTURES, EXCESS MORTAR ... and "DOWN-TIME"**

Speed REPAIR or CONSTRUCTION of your Furnaces by using a CLIPPER MASONRY SAW.

## EXCLUSIVE CLIPPER FEATURES

**AUTOMATIC BLADE PRESSURE**
Makes your blades last longer . . . Because Equalizer Spring Automatically cushions blade pressure whether cutting HARD or SOFT materials. Outstanding for blade economy.

**SELECT-A-NOTCH**
One man easily adjusts Cutting Head to desired height... Whether cutting 12" or 1" material. Operator's hands merely guide. Weight supported by rear Bar.

**SAVE-A-BLADE DIAL**
Just turn the Save-A-Blade Dial to the material hardness and the pressure Equalizer Spring automatically sets the tension—guarantees faster cutting and longer blade life.

**ADJUST-A-CUT CONTROL**
Pull the knob—and the Cutting Head is free for fingertip setting at any desired angle. Release the Knob—and Head is locked in the desired position.

## FREE TRIAL

The outstanding policy of *FREE TRIAL* has been in effect since Clipper invented the world's first Masonry Saw. Only through this Clipper *"FREE TRIAL"* are you guaranteed... ACTUAL TEST ON THE JOB...FULL SATISFACTION ...NO OBLIGATION!

## DUSTLESS *Masonry Cutting*

With the MODEL HD CLIPPER you can choose your cutting method... cut DUSTLESS (wet) in confined areas or DRY when DUST is not a problem. Remember too, there are NINE Clipper Models designed to perform with smooth simplicity and flexibility.

## NOW! CUT CONCRETE OR ASPHALT..

... BUILDING FLOORS
(PATCHES-TRENCHES)
HIGHWAYS • STREETS • WALKS
DRIVES • RUNWAYS • CURBS
with a
**CLIPPER CONCRETE SAW**
You Save Time and Material when you cut straight, smooth edges . . . then Break Out

**5 Models.. Gas or Electric Powered**

***GENUINE CLIPPER PRODUCTS SOLD ONLY DIRECT FROM COAST-TO-COAST FACTORY BRANCHES***

Clipper
NATION-WIDE DIRECT FACTORY SERVICE

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NAME_____
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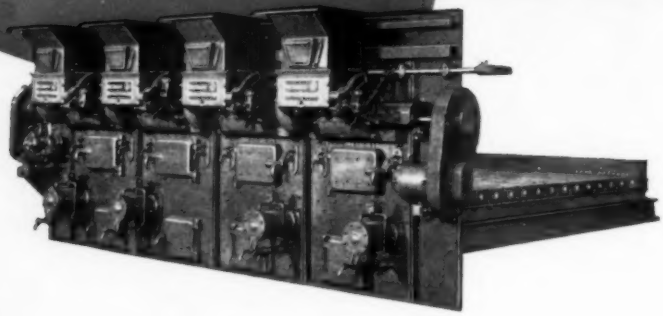
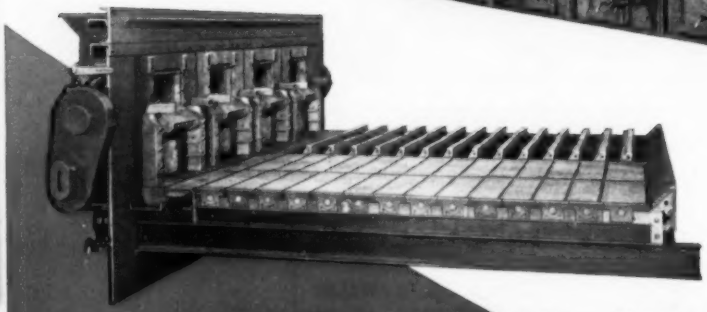
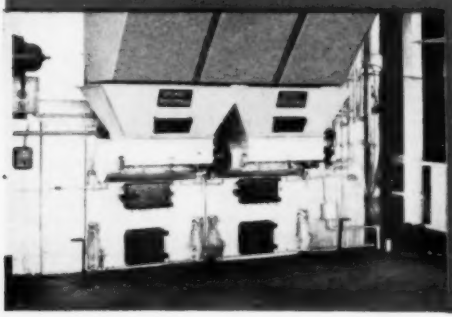
# SAVING COAL IS OUR BUSINESS

**Over 1800 Coal Saving—Cost cutting installations of Detroit RotoStokers Since 1931**





Power Dumping RotoStoker with four Rotors, driven by one 2 hp motor, with auxiliary turbine. A portion of the grate is shown in the dumped position. Built for Bibb Manufacturing Co., textile mill, Columbus, Georgia. Capacity, 60,000 pounds of steam per hour.



**First RotoStoker Installed in 1931**

This Hand Dumping RotoStoker in the Municipal Power Plant of Fort Morgan, Colorado, has been in service for 19 years—burning 9,000 B.T.U. Northern Colorado Lignite.

**Our 32 Years in Stoker Manufacture Exclusively, Including 21 Years of SPREADER Stoker Experience IS AT YOUR SERVICE.**

A pioneer in spreader stoker design and building, we have made applications of Roto-Stokers to all types and makes of boilers in a wide variety of plants both here and abroad.

## A DOUBLE SAVING

The RotoStoker provides a double saving: Saves first—by increased efficiency. Saves again—because it will burn any kind of Bituminous Coal or Lignite. Users, therefore, buy their coal at best price advantage.

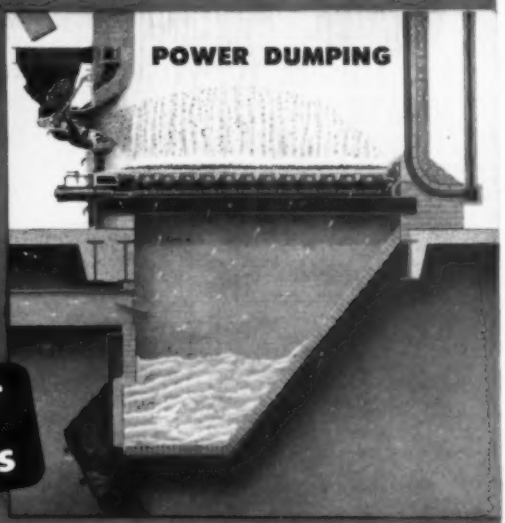
RotoStoker burning rates are higher and will provide you with more capacity. The ability to handle fluctuating loads has made it popular.

The Detroit RotoStoker has distinct advantages over other methods of firing.

As stoker designers and builders of fuel burning equipment exclusively, we recommend in each case the method of firing best suited to your plant and the fuel available.

STATIONARY GRATE—*The Stationary Grate RotoStoker is readily applied to small and medium boilers where no basement for ash handling is provided.*

HAND DUMPING GRATE TYPE—*With the Hand Dumping RotoStoker, a shallow ash pit, as shown, is often sufficient. Ashes are discharged by releasing dumping levers and removed through the ash doors at the front when convenient.*




**POWER DUMPING GRATE**—*Steam Cylinders provide power for dumping. Each grate section is dumped independently of the others. Balance of the stoker carries the load with uniform steam pressure.*

**OTHER TYPES AND SIZES OF DETROIT STOKERS FOR EVERY INDUSTRIAL NEED**

DETROIT SINCE 1903 STOKERS

# DETROIT STOKER COMPANY

**GENERAL MOTORS BUILDING, DETROIT 2, MICHIGAN**

*Works at Monroe, Michigan: District Offices in Principal Cities*

*( Continued from page 18 )*

or embedding in concrete. The connector consists of a split steel body and a cap-nut. In use, the body is inserted through the knockout from inside the box and the cap-nut finger tightened on outside. Thinwall conduit is inserted to shoulder stop inside connector body and cap-nut drawn tight with a few turns of a single wrench. The knurled chamfer on the connector body prevents slippage and eliminates locknuts.

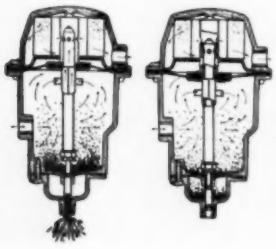
## 24—HAND PUMP COMES IN FIVE MODELS

A line of hand pumps, designated as Series 210, 404, 414, 828 and 807, is available from the Blackmer Pump Co. Series 210 is direct drive with a 10 gpm capacity. Series 404 is direct drive with a 10 gpm capacity. Series 414 is direct drive with 8 or 10 in. crank and 1 or 1¼ in. openings for

light or heavy liquids and delivers up to 14 gpm. Series 828 and 807, to 28 gpm, are geared hand pumps for normal or vicous liquids wherever liquids are dispensed from drum-size or larger containers. Series 828, 807, 414 and 404 are swinging vane construction with cam-bored bodies that deliver a nonpulsating flow while series 210 is sliding vane construction.

## 25—VALVE REMOVES AIR CONTAMINANTS

Valves for automatic removal of contaminants and precipitates from compressed air lines, after-coolers, sumps, tanks and air brake systems have been announced by the Wilkerson Corp. The line includes automatic separators and drains and has been field tested in hundreds of industrial

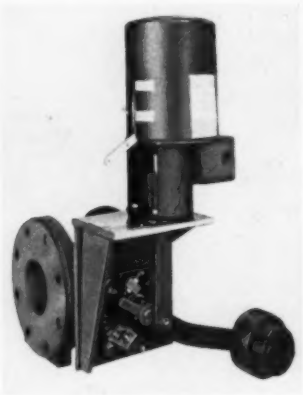


installations. When air line is not in use the diaphragm is forced down by back pressure with the "O" ring sealing the sump bottom. As air is used the pressure differential raises diaphragm and shaft, seals bottom of middle chamber, opens bottom of sump and blasts out contamination.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

## 26—RUBBER LINED VALVE MOTOR OPERATED

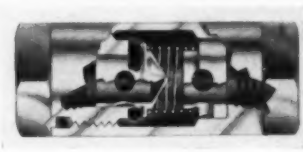
An emergency gas or liquid heavy duty cast iron rubber seated valve is available from R-S Products Corp. Rubber is compressed around the periphery of an angular seating vane to give positive shut-off even around the shaft bosses. This type of construction makes possible the use of an iron body valve that would normally call for stainless steel or other alloy. The rubber flanges take the place of the usual flange gaskets. The valve is completely cycled and operated by a direct-connected motor driven



pump, sealed in oil. Hydraulic pressure raises the counter-weight for the open position. When the valve is fully open the operating motor is cut off by an integral switch. While the operator is energized current consumption drops to the minimum. On current failure the oil operator is released, the counter-weight drops and the valve is closed. Sizes range from 2 to 72 in.

## 27—CHECK VALVE ULTRA-SENSITIVE

James-Pond-Clark has announced the introduction of a line of ultra-sensitive check valves. Designated as the 119 series, this device is designed for very low pressure pneumatic or gas systems where the slight-



est whiff of pressure must open the valve and absolute sealing is still a major requirement. It is normally manufactured in brass or aluminum, with other materials available to customer order. Cracking pressure is 4 to 8 in. $H_2O$. The valve seals before the pressure across the poppet is equalized and will hold bubble tight against any back pressure within its rated range of 0-100 psi. Sealing is obtained with an accurately machined knife edge poppet, which is impressed into the surface of an "O" ring. Damage to the "O" ring, as well as any vulcanizing tendency, is prevented by limiting the impression of the knife-edge to a few thousandths of an inch metal to metal contact between the poppet and the body carries the full load.

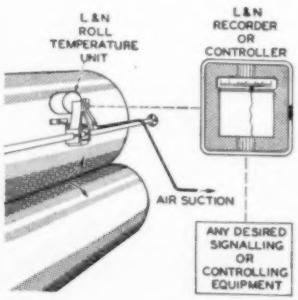
## 28—CONTROL UNIT IN MINIATURE SIZE

A control—no bigger than a dime—has been developed by Clarostat Mfg. Co., Inc., and is now available only on special order.

Each unit, housed in a yellow low-loss bakelite case, measures only ⅝ in. in diameter by ⅜ in. deep. Two units can be nested together and held by metal straps for dual-control combinations. Series 48 units are available in resistance values up to 3 megohms linear, and in tapers up to 1 megohm. Round or slotted shafts are available and also a shaft locking arrangement. Despite greatly reduced size, these subminiature controls are built for service.

## 29—DEVICE RECORDS ROLL TEMPERATURES

A roll surface temperature unit developed by Leeds & Northrup Co. measures temperature of a moving roll surface without touching the roll. It cannot scratch, score or in any




way destroy delicate surface films. Temperature detected by the unit is recorded automatically by an instrument supplied as an

*( Continued on page 126 )*

This acid-shield ALOYCO gate valve is made in a wide range of analyses to specification, and is regularly stocked in popular alloys.

Like all ALOYCO valves, its dependable performance results from:

**A.** Metallurgical research devoted *exclusively* to corrosive applications;

**B.** foundry and machine shop facilities set up for *only* high alloys;

**C.** casting and machining practices dictated by the difficult characteristics of the alloys required for corrosive services.

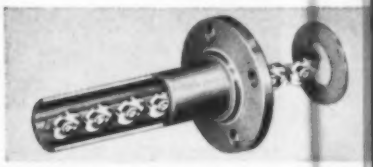
## Success Stories from ALOYCO's Corrosion Clinic

**THE CORROSIVE:** fatty acids.

**THE PLACE:** E. F. Drew & Company, Inc., Boonton, N. J.

**THE INSTALLATION:** Multiple steps in production of high-purity distilled and fractionated fatty acids—operating on vacuum service of 5-6 mm to 25 psi and temperatures of 125-500 F.

**THE VALVE:** ALOYCO 363 "Y" valve, 2 in. size, in alloy type 316 (18-8SMo).



*Orifice-type test rods exposed in customers' pipeline are studied to determine proper specification of valve material.*

**THE BACKGROUND:** The *Aloyco Corrosion Clinic* is a service to chemical process engineers who encounter problems of corrosive damage to valves.

Alloy Steel Products Company maintains the *largest* laboratory devoted *exclusively* to the "diagnosis" and "treatment" of problems relating to valves in corrosive service. From the results of laboratory and field testing, it develops the specifications for customers' applications.

Its success in lengthening valve life on corrosive services explains why *more* ALOYCO corrosion-resistant valves are used than any other brand.

If *your* plant deals with severe corrosives or must guard against product contamination or discoloration, put your problem before The *Aloyco Corrosion Clinic.*

**ALLOY STEEL PRODUCTS CO., INC.**
**1305 West Elizabeth Avenue, Linden, N. J.**

Longer Lasting
**ALOYCO VALVES**
1st in Corrosive Service

# new bulletins and catalogs

**Be sure to order your free copy of these booklets—they're the latest information published by leading manufacturers. Use the postage-free order cards on page 117. Just list the key numbers of the bulletins you want in the spaces provided on cards**

### BOILERS, AUXILIARIES, ACCESSORIES

**200—Stokers.** Continuous ash discharge stokers are the subject of 4-page bulletin. Cutaway views show how the grates may be installed to discharge to either front or rear. Gives list of boilers equipped with the units and offers engineering service for consultations. Another 4-page folder tells the story of spreader stokers. Photos and drawings present features that make it possible to operate at high ratings and high furnace temperatures. Hoffman Combustion Engineering Co.

**201—Refractory Products.** Well-illustrated 52-page bulletin gives installation procedures and anchoring methods for refractory material that has the consistency of stiff putty. Explains why fire brick linings fail and offers suggestions on how to overcome the failures with monolithic construction. Numerous diagrams, drawings and photographs graphically portray the simplicity of working with any of the four products described. Settings for all types of boilers are shown and numerous accessories for efficient boiler operation are illustrated. Plibrico Jointless Firebrick Co.

**202—Precipitators.** Bulletin 1728 contains factual information on precipators designed to handle fly ash, cinders, and industrial dusts. The 12-page booklet gives operational data and shows the compact arrangement of the units. Performance factors, efficiency curves and selection charts are included as is dimensions and physical data table. Shipped in sub-assemblies and also available in combination packages. American Blower Corp.

**203—Condenser Tubes.** Present restrictions on the use of copper and its alloys still further stress the importance of extending condenser tube life. "Life Extension for Condenser Tubes," is a 28-page report on causes of corrosion and means of combating them, as well as on the choice of condenser tube materials. Divided into nine sections, the book tells the complete story from preventive metallurgy to composition and general recommendations. Useful table gives estimating data for condenser and heat exchanger tubes in various alloys. Revere Copper and Brass Inc.

**204—Tube-Supported Walls.** How walls may be suspended directly from boiler tubes with resulting savings in steel and erection times is detailedly described in 12-page catalog. Engineering drawings show typical jobs and portray how the enclosure is fastened to the boiler tubes. Of particular interest is a series of photos showing a job being erected. Bigelow-Liptak Corp.

**205—Unit Steam Generator.** Design features of heavy-duty, self-contained, fully automatic, portable steam plant are described in 8-page bulletin. Contains data and dimensions in tabular form along with typical performance curves. The unit has a guaranteed thermal efficiency of 80% and permits fully automatic operation even with No. 6 oil. Recent development provides for either gas or oil firing, alone or in combination. Preferred Utilities Mfg. Corp.

**206—Firebrick.** Economic advantages, industrial applications, and refractory properties of insulating firebrick are presented in 4-page folder. Says product is the highest temperature insulating firebrick for exposed or back-up use. Physical and thermal characteristics are given in table form. Illustrations show application in construction of slot type forging furnace. Also contains summarized information on accessory materials. Johns-Manville.

**207—Steam Generator.** Complete, compact, standardized design, controlled re-circulation steam generator is thoroughly described in 6-page folder. Gives description, principal features, background, application, and list of users. Cutaway vertical section shows the arrangement of the heating surfaces. Gas fired and oil fired units are illustrated. Available in several sizes for capacities up to 6000 lb of steam per hr and for operating pressures up to 300 psi. Completely automatic operation. Combustion Engineering—Superheater, Inc.

**208—Oil Burners.** Up-to-date 6-page bulletin gives you all the details on Preferred's horizontal rotary heavy-oil burner. Dual pump reservoir, patented "Voluvalve" fuel regulator, high-speed belt drive and other engineering features are explained fully. Preferred Utilities Mfg. Corp.

**209—Spreader Stoker.** Bulletin describes spreader stoker having overthrow rotors that provides uniform fuel distribution. Available in various sizes with stationary, hand dumping and power dumping grates. Burns all grades of bituminous coal, lignite, and wood and other refuse. Detroit Stoker Co.

**210—Oil Burner Products.** Condensed 16-page catalog gives complete listing, with illustrations, of oil burner products including fully automatic horizontal rotary type, steam turbine driven type, combination gas-oil type, semi-automatic, and pressure atomizing types. Booklet also features selector chart, plus table of specifications and capacities and will prove helpful where additional installation knowledge is required before ordering equipment. Operation and control of each unit is described in detail. Ray Oil Burner Co.

**211—Boilers & Stokers.** The results of over 88 years experience are embodied in the design and construction of Scotch Marine type portable boilers says 28-page catalog. Explains the basic principles along with many new features which are said to account for high economy and efficiency. Advantages of this internally fired, return-tubular boiler are thoroughly discussed. Photographs and cross-sections illustrate various models ranging in capacities from 6 hp up to 250 hp. Specifications table for these boilers built to the ASME code is included. Details and features of underfeed stokers designed especially for this type boiler are contained in separate section. The James Leffel & Co.

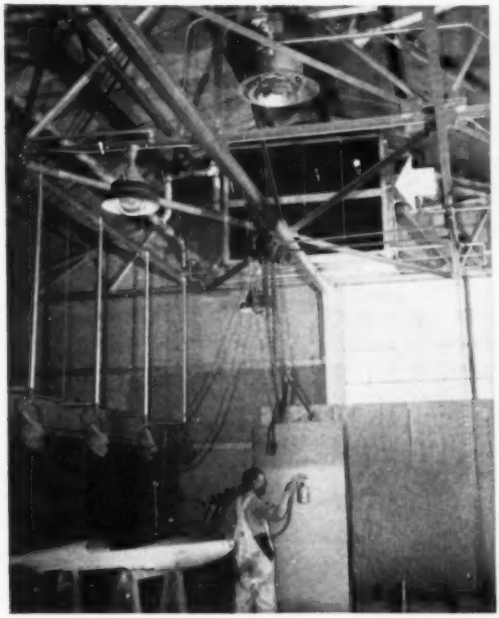
### PRIME MOVERS: DIESELS, TURBINES, COMPRESSORS

**212—Refrigeration Compressor.** Detailed description of the 2, 3, 5, and 7½ hp hermetically sealed refrigeration compressors and condensing units is given in bulletin 101-110. Features of the units are discussed in detail and illustrated liberally. Complete specification data are included. Westinghouse Electric Corp. Sturtevant Div.

**213—Turbo Compressors.** Comprehensive information on the application of turbo compressors to oil and gas fired equipment used in agitation, cooling, drying, gas boosters and pneumatic systems is provided in 12-page bulletin 126-A. Performance curves, tables of capacities for both vacuum and pressure applications are included. The Spencer Turbine Co.

**214—Plant Equipment.** Booklet 122-A describes compressors, vacuum pumps, ejectors, centrifugal pumps, blowers, engines, condensers and other plant equipment. Well illustrated with installation photos, the 12-page publication

*( Continued on page 28 )*



## Paint Shop . . . Assembly Line . . . Shipping Room . . . Craneway . . . Machine Shop

# Trane Heating Serves Everywhere in Industry

If you have a heating or drying job to do in your plant, it's likely that a Trane product has done the job before—effectively:

**Negative Pressures**—One large aircraft-testing factory had a negative-pressure problem caused by fume-exhaust in a paint shop. Ventilation air introduced through a Trane Tempering Coil (see arrow) corrected the negative pressure.

**High Output Heaters**—Long assembly lines, like the one in an eastern clock factory, call for a lot of heat thrown a long way. Big Trane Torridors, the high-output blower unit heaters, handle these jobs hanging from ceilings, mounted on walls, or standing on the floor. And they'll supply ventilation, too.

**Door Blanketing**—A midwest stove manufacturer found that shipping rooms, with oft-opened doorways, can be gathering places for fuel-consuming drafts. Ceiling mounted Trane Projection Heaters spot heat right where it's needed; save precious floor space.

**High Ceilings**—A gyroscope manufacturer wanted heat from a high ceiling, using vertical discharge units that wouldn't interfere with his craneways or overhead equipment. He used Trane Projection Heaters mounted forty feet up. Workers far below are kept warm even in coldest weather.

**Roof Ventilators**—A midwest machine shop had serious ventilating problems until Trane Roof Ventilators were brought in. These powered ventilators drew air into the building, heated it, circulated it, solved the problem.

***Whatever your factory heating, ventilating, cooling or air conditioning problem is, look for the answer in the Trane line.***

**Shipping Room**—More room for materials, more heating efficiency with Trane Projection Heaters tucked away at the ceiling, and spotting heat right where it's needed.

**Craneway**—High ceilings and craneways are no obstacle to efficient heating. Not with Trane Projection Heaters and Louver Cone Diffusers to deliver heat to working areas.

**Machine Shop**—Trane Roof Ventilators handle the extra heat generated by machines in shops like this one, drawing in outside air, heating it, circulating it.

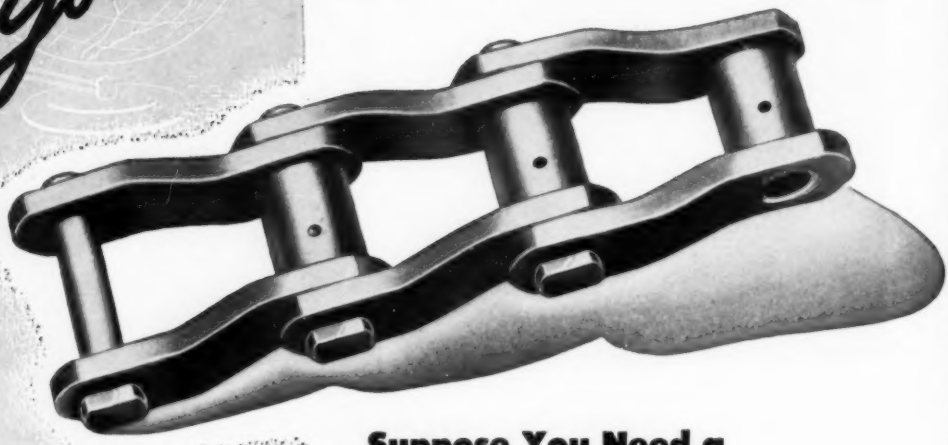
**TRANE**

MANUFACTURING ENGINEERS
OF HEATING, VENTILATING AND
AIR CONDITIONING EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS.
Eastern Mfg. Division, Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . Toronto
OFFICES IN 80 U.S. and 10 CANADIAN CITIES

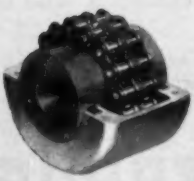
*Wherever You are...*

# UNION CHAIN
## is at your service

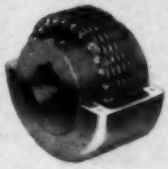


UNION ROLLER CHAIN

UNION SILENT CHAIN



UNION
ROLLER CHAIN
FLEXIBLE COUPLINGS



UNION
SILENT CHAIN
FLEXIBLE COUPLINGS

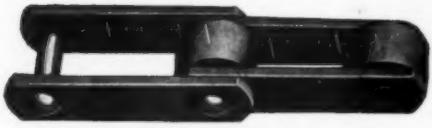
## Suppose You Need a UNION Heavy Duty Chain

... for a drive or conveying application where heavy loads, slower speeds, long life and moderate cost are factors. Union Chain manufactures a complete line of these heavier types of chains, sprockets, flights and aprons, in addition to roller chain and silent chain, and is therefore in a position to make competent, unprejudiced chain recommendations.

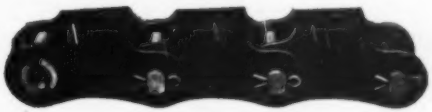
**Furthermore,** an important phase of Union's service to its customers is the designing and building of special chains for unusual applications, particularly for conveying and elevating. Union is in an unusually fortunate position to render such service since we manufacture steel chains of all types and nothing else. This specialization has given us an unusual insight into problems of power transmission and conveying which our customers find valuable to them.

Perhaps we can be of help to you. Your inquiry will be welcomed.

## TYPICAL UNION DRIVE AND CONVEYING CHAINS



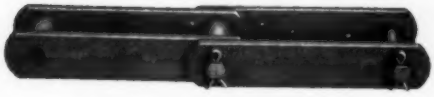
HB STRAIGHT SIDE BAR ROLLER CHAIN



BRIDGE CHAIN

BP CHAIN

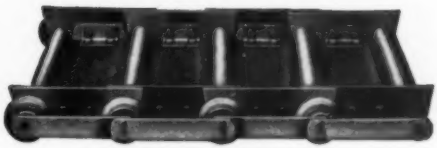
BP ICE CHAIN



HB STRAIGHT SIDE BAR BUSHING CHAIN

COMBINATION MALLEABLE IRON AND STEEL CHAIN

APRON CONVEYOR STYLE A



APRON CONVEYOR STYLE B

## UNION CHAIN REPRESENTATIVES

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**American Chain & Gear Co.**
**C. A. Nicholas**
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Atlanta, Georgia

**ILLINOIS**
**Union Chain & Mfg. Co.**
**W. Albrecht**
**A. C. Mohr**
**B. Nelson**
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53 W. Jackson Blvd.
Chicago, Illinois

**INDIANA**
**Paul W. Huddleston**
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Indianapolis 20, Indiana

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**F. N. Johnston Co.**
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New Orleans, La.

**MASSACHUSETTS**
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Newton Highlands 61, Mass.

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Detroit 2, Michigan

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**Union Chain & Mfg. Co.**
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**F. Smiley**
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Portland 14, Oregon

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**David Davies**
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**F. R. Magill Company**
44 McKnight St.
Pittsburgh 20, Pa.

**Union Chain & Mfg. Co.**
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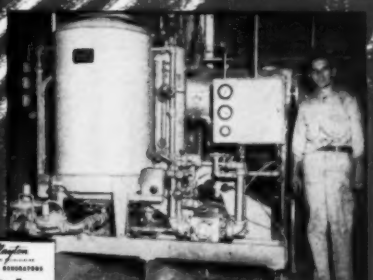
TRANSMIT POWER
UNION CHAINS
CONVEY MATERIALS

PROCESSING
STEAM
at LOWER COST

- BECAUSE:
- fuel savings of from 20% to 50%
- full operating pressure in 5 minutes from a cold start
- instant recovery to meet any peak demand within rated capacity
- simple, safe and foolproof control of feedwater and fuel
- no expensive standby losses
- low installation cost—small pump or pump to install—no flue, stack or accessories
- less space and weight per horsepower



To learn how this 50 h. p. Clayton Forced Recirculation Steam Generator reduced steam production costs by 70%. MAIL THE COUPON

MAIL THIS COUPON TODAY

Send name of nearest distributor and arrange desk demonstration of Clayton *Forced Recirculation* principle. Send catalog. IP-5

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Animated flow chart shows how *Forced Recirculation* principle cuts steam costs.

Clayton MANUFACTURING COMPANY
BOX 550, EL MONTE, CALIFORNIA

*( Continued from page 24 )*

also shows cutaway drawings of many units. Refers to catalogs for more detailed information on specific products. Ingersoll-Rand Co.

**215—Diesel Engines.** New line of four-cycle, direct-injection, totally enclosed engines is illustrated and described in 18-page bulletin. Photographs, cutaway line drawings and specifications are shown. Also described are supercharged engine, dual fuel and supercharged dual fuel diesel engines. Worthington Pump & Machinery Corp.

**216—Diesel Engine.** Construction and operation features of 4-cycle, one-cylinder and recently introduced 2-cylinder, vertical, mechanical injection diesel engine are contained in 6-page bulletin. Illustrates various applications including electric generating sets and pumping units; also, clutch or stub-shaft power take-off for direct connection or belt drive. Gives kw rating and pumping capacities of the different models. Pictures all main engine parts and gives their particular specifications. Nordberg Mfg. Co.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

**217—Turbo-Compressors.** Centrifugal turbo-compressors which increase the air pressure in stages by means of lightweight impellers are the subject of 12-page bulletin. Construction and features are discussed. Multi-stage and single-stage machines are described and sketched. Overhung and outboard types are shown along with gas boosters, midget turbos, air filters and blast gates. Rating tables and performance curve offer data in capsule form. Two pages of application photos are included. The Spencer Turbine Co.

**218—Turbine-Generators.** Turbine-generators (500 kw and above) are covered in 40-page bulletin that pictures and describes nearly 50 installations, both utility and industrial. Brief discussions of generator and exciter cooling methods are included. Detailed drawing shows a typical turbine-condenser installation arrangement. Dimensions and weights of standard units are tabulated. Turbine Div., Elliott Co.

## WATER AND LIQUID TREATMENT

**219—Organics.** Interesting 4-page folder describes the need for organics in altering the nature of sludge in order to make it non-adherent. It covers the theoretical and practical considerations involved in the use of organics, and describes and illustrates the manner in which they overcome the problems of sludge. Also contains microphotographs of adherent sludge, showing the results that can be expected from the use of organics. E. F. Drew & Co., Inc.

*( Continued on page 30 )*

**SILENTLY**, but ruthlessly *(even as you are reading this)* rust is gnawing away at machines, tanks, fences, pipes, fire escapes, metal sash, stacks —every rustable metal—inside and outdoors!

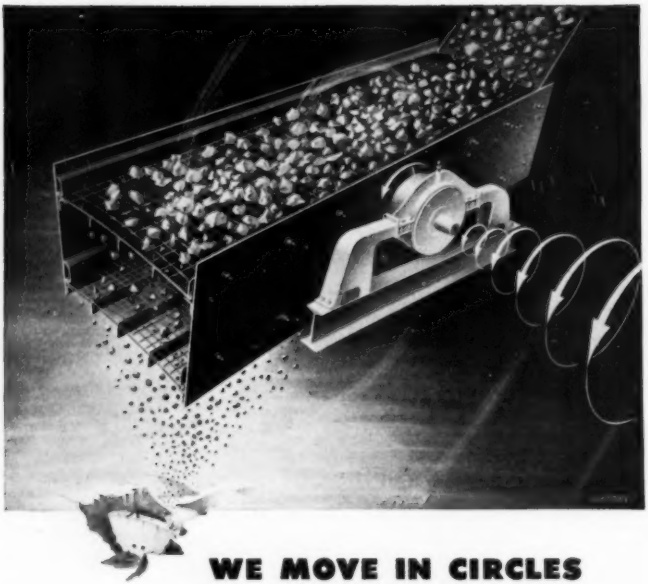
To protect your investment — to keep every possible pound of new steel for the defense program — to make all rustable metal surfaces last longer—*adopt rust control with RUST-OLEUM as an important part of your maintenance program.*

RUST-OLEUM stops rust! Its tough, pliable, rust-resisting film gives excellent protection that prevents rust losses under many difficult rust-producing conditions.

RUST-OLEUM can be applied *even* over rusted sufaces. It is not necessary to remove all the rust. Just use wire brush and sharp scraper to remove rust scale and loose rust. Economical and easy to use because no sand blasting or chemical pre-cleaning is required.

RUST-OLEUM can be obtained promptly from Industrial Distributors' stocks in principal cities of the United States and Canada. Anticipate your needs and order now! For complete catalog see *Sweet's*, which also lists your nearest source of supply, or write on your company's letterhead for full information.

**RUST-OLEUM CORPORATION**
2472 Oakton Street, Evanston, Illinois



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From alum to zinc ore, there's a *better* way to size and screen bulk materials . . . in the sizes you need . . . at the capacity you want . . . at the speed you expect . . . with the accuracy you have a right to demand.

It's the Hewitt-Robins Vibrex® Vibrating Screen . . . the screen that moves in circles to get things done.

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The instant coffee that brightens your breakfast table . . . the sand and stone that build mighty dams . . . the lanolin that nourishes your skin . . . shiploads of oil from far-off Africa—these and hundreds of other essentials of social and industrial life are processed, screened, purified and sized on Hewitt-Robins Vibrating Screens.

Whatever your screening problem—whether it involves tiny specks or multi-ton boulders—make it *ours*.

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*Executive Offices:* 370 Lexington Avenue, New York 17, N. Y.

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**ROBINS CONVEYORS DIVISION:** Conveying, screening, sizing, processing and dewatering machinery
**ROBINS ENGINEERS DIVISION:** Designing and engineering of materials handling systems

Hewitt-Robins is participating in the management and financing of Kentucky Synthetic Rubber Corporation

*( Continued from page 28 )*

**220—Hydrogen Zeolite Softeners.** Publication 4530 on hydrogen zeolite softeners is a 16-page bulletin giving a complete description of the process and the field of application. Shows the advantage of hydrogen zeolite softening and its relation to the sodium zeolite softening process. Presents exhaustive explanation not only of the process, but of the zeolites themselves and the details of the equipment used in the process. Cochrane Corp.

**221—Feedwater Control.** Bulletin 489 contains 16 pages of factual information on boiler feedwater control at three plants of the Georgia Power Co. The report shows flow charts and diagrams along with photographs illustrating the equipment. Data in the performance report are derived from records over several years. Northern Equipment Div., Continental Foundry & Machine Co.

**222—Oil & Water Cooler.** Helically finned heat-transfer elements provide lighter, more compact and less costly unit for cooling service says 20-page bulletin. Design details are described and illustrated. Complete selection data are given for various ranges of duties together with dimensions and specifications for standard sizes. The units are reported to be particularly adapted to services such as cooling diesel engine jacket water, lubricating oil, transformer oil, and quenching oil. The Griscom-Russell Co.

### FILTERS, STRAINERS, CLARIFIERS, DEHYDRATORS

**223—Oil Purification.** Up-to-date information on oil purification for hydraulic equipment, metal-working machines, gas and diesel engines, turbines, transformers, etc., is given in 16-page booklet, entitled "The Facts About Clean Oil". Answers questions about oil purification and shows correct method and equipment to improve and increase efficiency. Actual case histories quote substantial savings in oil consumption and equipment operating and maintenance costs. Photographs illustrate applications of the equipment. Honan-Crane Corp.

**224—Dehydrator.** For efficient drying of gases, air or liquids, Pritchard recommends its Hydryer. Five types are illustrated and described in 4-page bulletin. Discusses design and operation of standard and special types. Other products are briefly described. J. F. Pritchard & Co.

**225—Water Filters.** Self-cleaning filters designed to filter large volumes of water and other liquids rapidly and at low cost are the subject of 6-page bulletin. Discusses self-cleaning feature which cuts actual cleaning time to approximately 6 min. Illustrations show several typical installations along with drawings of piping arrangements. Sparkler Mfg. Co.

**226—Pipeline Filters.** This 8-page bulletin describes, illustrates and gives applications and specifications for 75 pipeline filters for air and other gases.

Principle that provides both mechanical separation and filtration is discussed along with features that permit the unit to function as both separator and filter. Installation views show a new filter built for air pressures up to 6000 psi. Also shown are vacuum and absorption types along with special models for removal of carbon black and aluminum oxide. Dollinger Corp.

**227—Filter-Clarifier.** Does your processing require a crystal-clear filtrate? 4-page bulletin gives you operating principles, typical performance data, capacities and advantages of filter-clarifier. Not a backwash type, but uses, instead a spiral scraper that takes a cut off the sand bed when the filter rate decreases. Hardinge Co., Inc.

**228—Centrifuges.** Almost all modern industrial processes have the problem of continuously and economically handling large quantities of slurries and suspensions. Here is a 12-page bulletin to help solve your problems. Explains operating principles and applications for two types of high speed horizontal centrifuges. Cutaway drawings as well as installation photos illustrate the book. The Sharples Corp.

### ELECTRICAL EQUIPMENT

**229—Synchronous Generators.** "Hydraulic Turbine Driven Synchronous Generators and Large Vertical Motors" compares the suspended and umbrella types of vertical generators, describing construction details. In addition, the horizontal generator is described. Special modifications that can be incorporated into the design of hydraulic turbine generators are listed, along with accessories and tools. Large vertical motors are briefly described and mention is also made of the combined motor-generator unit that can be used alternately as a hydraulic turbine-generator and as a motor-driven pump. Bulletin O5B7549, 32 pages. Allis-Chalmers Mfg. Co.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

**230—Enclosed Motors.** Especially suitable where corrosion is a problem are these totally enclosed fan-cooled motors says 4-page bulletin MU-132. Explains the advantages of cast iron construction and describes other features which are said to add up to a long life and dependability. Available in ratings from 2 to 250 hp. Frame sizes and principal dimensions are given. Lists recommended applications. Wagner Electric Corp.

**231—Panelboards.** Standard unit steel panels, designed in several sizes, with accessories for quick, easy installation are described in 4-page catalog 143. Shows the arrangements possible with various units. Numerous features are described. Falstrom Co.

*( Continued on page 137 )*


A SHORT STATEMENT ON

STEAM TRAPS

THAT IS LONG ON GOOD SENSE:

A Steam Trap has but *one* function—to drain condensate from steam lines. Right?

Now if one brand of Steam Trap can drain *twice* as much condensate $ $ = $ under equal conditions, as another of the same size and price—it's just plain common sense to buy that brand, isn't it?

Clark DUO-STEP LEVERAGE STEAM TRAPS have proved in tests time and time again that they *can* drain *twice* the condensate of ordinary traps.

So—do as thousands of smart steam engineers have done:

SWITCH TO CLARK DUO-STEP STEAM TRAPS FOR DOUBLE DRAINAGE EFFICIENCY!

THE CLARK MANUFACTURING COMPANY

1846 East 38th St. • Cleveland 14, Ohio

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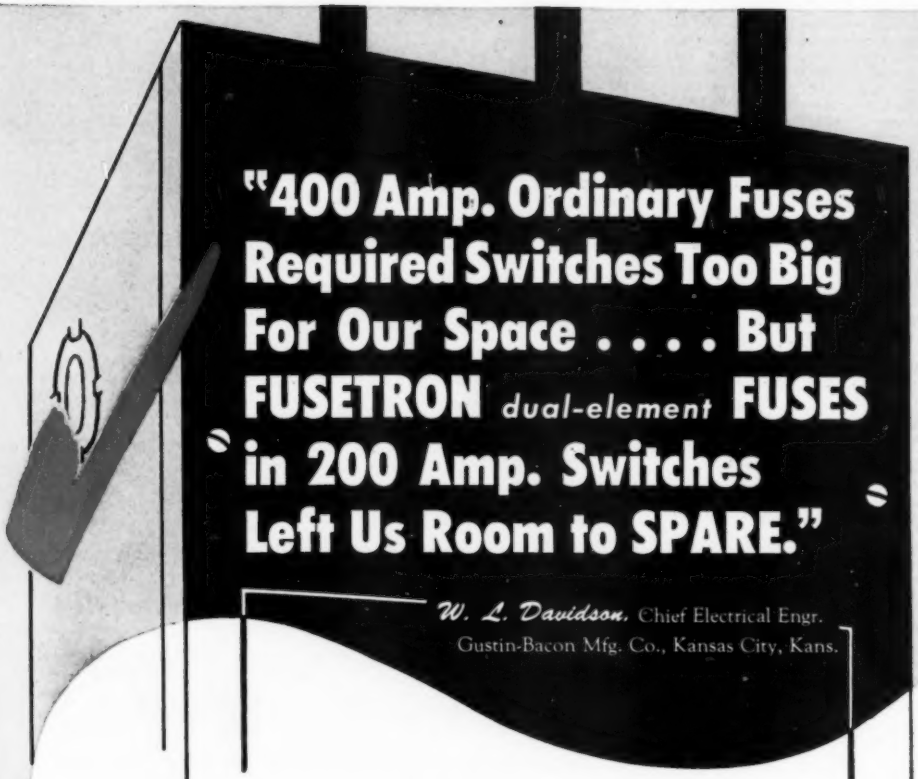
THE HOME OF DUO STEP LEVERAGE

The complete line of dependable fluid controls



# "400 Amp. Ordinary Fuses Required Switches Too Big For Our Space . . . . But FUSETRON *dual-element* FUSES in 200 Amp. Switches Left Us Room to SPARE."

*W. L. Davidson*, Chief Electrical Engr.
Gustin-Bacon Mfg. Co., Kansas City, Kans.

"When we were revamping five 3 phase 220 volt motor circuits, each feeding a 25 h.p. and a 15 h.p. motor, at our Fairfax plant — we found we were short of room for the 400 amp. main switches required by ordinary fuses.

"By changing to Fusetron dual-element fuses, however, we were able to use 200 amp. switches and have room to spare.

"The installation has proved very satisfactory, and in addition, we get better protection because the motors are fused nearer to the operating load."

(FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.)

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

# You Get 10 Point Protection by changing to

# Fusetron DUAL-ELEMENT Fuses

1* Protect against short-circuits.

2 Protect against needless blows caused by harmless overloads.

3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.

4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.

5 Protect motors against burnout from overloading.

6 Protect motors against burnout due to single phasing.

7 Give DOUBLE burnout protection to large motors — without extra cost.

8 Make protection of small motors simple and inexpensive.

9 Protect against waste of space and money — permit use of proper size switches and panels.

10 Protect coils, transformers and solenoids against burnout.

*Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

## Here's Why You Get This All-Purpose Protection

The fuse link element opens on short-circuit — the thermal cutout element protects on overloads — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses — fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

## Don't Risk Losses!

One **needless** shutdown . . .
One **lost** motor . . .
One **destroyed** switch or panel . . .
One **burned out** solenoid . . .

May cost you far more than replacing every ordinary fuse with a Fusetron dual-element Fuse.

***Mail the Coupon Now!***

Bussmann Mfg. Co., University at Jefferson
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Please send me complete facts about FUSETRON dual-element Fuses.

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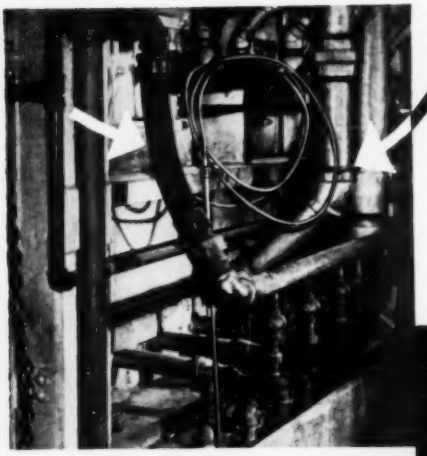
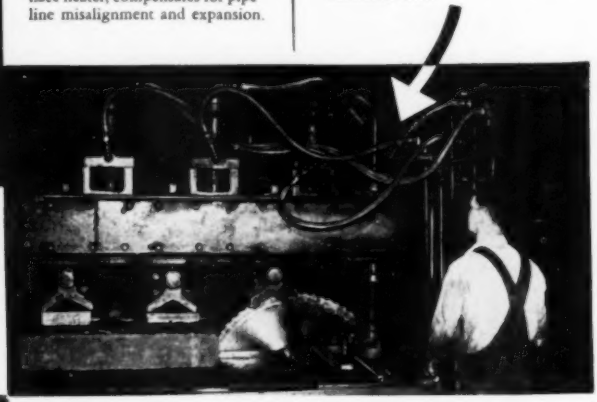


## Carries Fire and Water

This coil of American Flexible Metal Hose feeds gas to torch for lighting annealing furnace burners. It replaced nonmetallic hose which rapidly deteriorated. Large section of hose in foreground carries coolant water to furnace heater, compensates for pipe line misalignment and expansion.

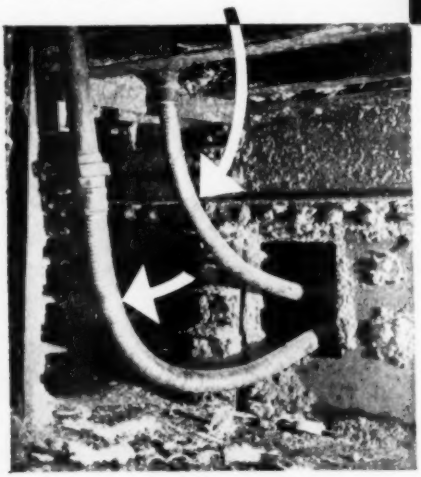
## Permits Bigger Bite

Originally, swing joints connected 600 p.s.i. hydraulic lines to platens for holding metallic billets during shearing on this machine. But swing joints limited travel for billet size adjustments. Now American Flexible Seamless Bronze Tubing lets machine take maximum bite.



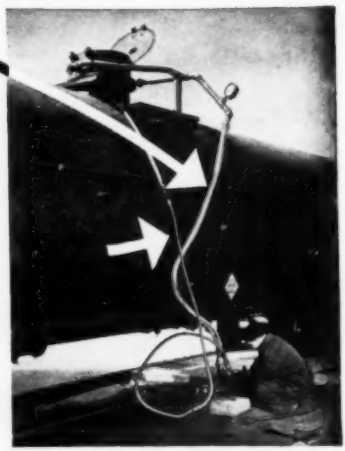
## Ignores Molten Metal

Only metal hose like this American Flexible Interlocked Bronze Hose can ignore regular splashings by molten casting metal. These carry supply and return water at 150 p.s.i. for cooling casting molds.



## Makes Unloading Easy

American Seamless Flexible Metal Tubing makes unloading this car of liquid propane easy. Propane vapor at 125 lb. pressure is pumped into tank car through combination ¾ in. and 1 in. flexible metal tubing, forcing out propane liquid through 2 in. flexible tubing connection between dome and storage tank lines. American Seamless stands wear, makes car-spotting simple.



**let it help you.** American Flexible Metal Hose or Tubing can simplify your product or operations wherever flexible connectors are needed: for piping or ports that move, vibrate or are out of alignment; for carrying almost any liquid, gas or semi-solid. American Flexible Metal Hose and Tubing are tight, strong and corrosion-resistant.

Bulletins SS-50 and CC-300 contain information you ought to have about these versatile products. For your copies, just write The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd.

*wherever connectors must move . . .*

**American**

ANACONDA

**FLEXIBLE METAL HOSE AND TUBING**

# This supply line is geared for your stepped-up production

**AMERICA REARMS.** This rearmament program undoubtedly means that your plant has, or will have, a greatly stepped-up production schedule. And with new machines and new operations, new lubrication problems are created.

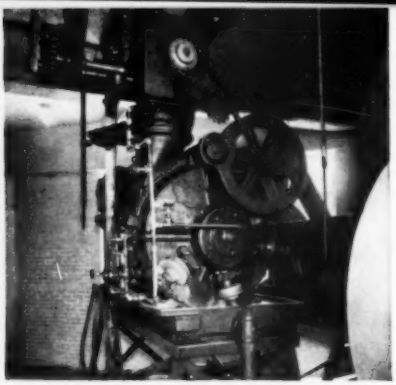
That's where we come in. A Standard service-supply center is near your plant. Any petroleum product you need can be delivered to your door within a few short hours. You need never worry about production delays, and you can avoid the expense of stocking large supplies of lubricants and fuels within your plant.

Your nearby Standard service-supply center is your always-dependable Supply Line. It is also headquarters for a Standard lubrication specialist, a man specially trained to give you expert and thorough advice on any lubricating problem, is also available through this service-supply center. His services, along with Standard Oil's efficient supply service, can help your important production go like clockwork.

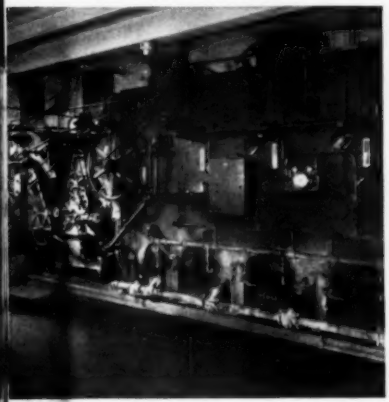
To arrange for a visit from your nearest lubrication specialist, phone your nearby Standard Oil service-supply center or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

**STANDARD OIL COMPANY (INDIANA)** STANDARD

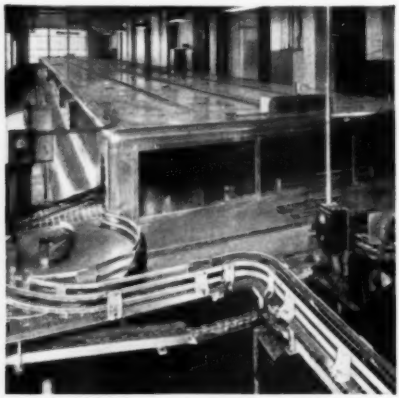
*Keg scrubber*—A constant stream of water at 130°F plays over these barrels and reaches bearings on conveyor.



*Wet-grain press*—After being heated to 180°F, grain is then pressed dry. Hot water comes in contact with bearings.



***Bottle** soaker and washer*—Bottles are first cleaned with strong alkali at 180°F, then washed with water. These conditions make bearing lubrication difficult.



*Pasteurizer*—Beer is pasteurized in this modern machine which is subjected to constant water spray ranging from 80°F to 140°F.

# No trouble brewing for bearings!

A midwest brewing plant employed seven different greases in a variety of applications. Despite the use of these special products, the operators experienced difficulty. The greases would not withstand both water and high temperatures. Frequent applications were necessary.

A Standard Oil lubrication specialist was called in on this problem. Upon his recommendation, STANOLITH Grease—a lithium-soap product with the ability to withstand both heat and water—was given the job.

As a result, STANOLITH has replaced all seven greases formerly used and *has done a better job in each type of application.* Through its use over a two-year period, grease consumption has been reduced 20% and time spent in applying grease cut 50%.

STANOLITH Grease can prove its remarkable versatility in your plant, too. Its high mechanical and chemical stability plus its extreme resistance to heat and water qualifies it to replace a variety of special greases.

**STANOLITH**
TRADE MARK
**Greases**

To obtain maximum benefits from STANOLITH, use the services of a Standard Oil lubrication specialist. His headquarters are near your plant. How you can benefit by his on-the-spot service is explained at the right.

Standard Oil Company, 910 South Michigan, Chicago 80, Illinois.

# What's YOUR problem?

**Mr. D. V. Wills** of Standard Oil's South Bend office is the lubrication specialist who helped this Midwest brewing company solve a difficult lubrication problem.

He is one of many Standard Oil specialists located throughout the Midwest. These men have the practical experience and special training to handle lubrication problems on any type of operation.

Take advantage of the service offered by the lubrication specialist nearest your plant. You can reach him by phoning your local Standard Oil Company (Indiana) office. Why not call, today, and arrange to discuss with him the advantages offered you by STANOLITH and other outstanding products such as:

**STANOIL Industrial Oils**—This general-purpose line of oils provides cleaner operation of hydraulic units and supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

**SUPERLA Greases**—Available in a wide range of consistency grades and in both lime-soap and soda-soap types, SUPERLA Greases cover a wide range of applications. These efficient products are comparable in quality with the highest type of special greases.

**STANORUST Rust Preventives**—The eight grades of STANORUSTS form one of the most complete and effective lines of rust preventives on the market today. Each has been scientifically developed for its intended use. The grades range from a fingerprint remover to a heavy petrolatum that protects against corrosion for years under the most severe outdoor exposure.

STANDARD OIL COMPANY (INDIANA)

# *All These Were Once*
# DUST COLLECTION PROBLEMS, TOO

*48 Carbon Black Plants*

*203 Metallurgical Installations*

*205 Acid Plants*

*40 Paper Mills*

*270 Detarring Installations*

*216 Power Stations*

*73 Steel Plants*

*99 Oil Refineries and Miscellaneous Installations*

Your electrical precipitator installation will be individually engineered...and based on the Research Corporation's *experience* graphically shown by that towering pile of thousands of blue prints.

This knowledge is a valuable asset that will help Research engineers to "tailor-make" your Cottrell installation. For example, they can more quickly determine the right answers to such variables as the size, shape and type of both discharge and collecting electrodes, their relative spacing, flue arrangements and many other factors. At Research you can count on *profitable solutions to individual problems.*

In hundreds of power plants today, Research Corporation Cottrells are collecting 90% to over 99% of fly ash from pulverized fuel boilers. Write for your free copy of an informative booklet giving valuable data on these installations. RC-116

## *Typical One Day Collections:*

250 TONS OF FLY ASH • 6 TONS OF SODA SALTS AT A PAPER MILL • 25 TONS OF SODIUM SULPHATE AT A KRAFT MILL • 6 TONS OF BLAST FURNACE DUST

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*405 Lexington Avenue, New York 17, N. Y.*
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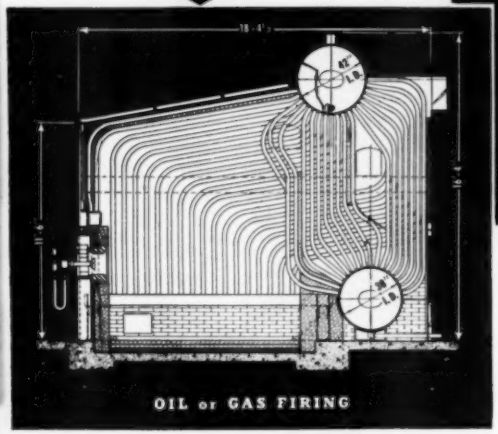
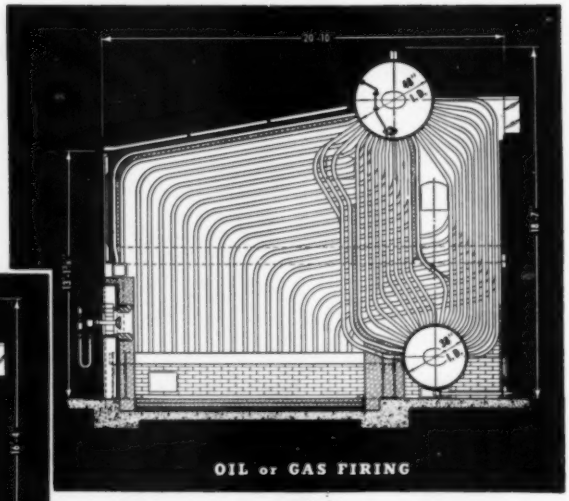
# WHICH V-C Meets Your Needs?

## Both are High Capacity 2-Drum Water Tube Boiler Units for Limited Space ····

## 3 V-C

This series with 42" top drum—17 tubes deep thru the main boiler bank, has integral water cooling in front, sides and top. A selection of 17 standard sizes available in widths from 5'-2" to 17'-2" and heating surfaces from 1394 to 5426 square feet.




## 4 V-C

This series with 48" top drum—19 tubes deep thru the main boiler bank—has integral water cooling in front, sides and top. A selection of 17 standard sizes available in overall widths from 5'-2" to 17'-2" and heating surfaces from 1850 to 7245 square feet.

WRITE for Erie City Bulletin SB37A containing complete engineering data for Types 3 V-C and 4 V-C 2-Drum water tube boilers for spreader stoker, underfeed stoker and oil or gas firing. Investigate this steel cased, completely water cooled steam generator which incorporates modern ideas in a compactly designed high efficiency unit.

COMPLETE STEAM POWER PLANT EQUIPMENT

**ERIE CITY**

Complete Steam Generators • Type C 3-Drum Boilers • Types VL & VC 2-Drum Boilers • "Economic" Boiler with or without Water Walls • Welded H. R. T. Boilers • Welded Steel Heating Boilers • "Keystone" Packaged Steam Generators • Coal Pulverizers • Underfeed and Spreader Stokers • Welded Pressure Vessels for the Process Industries.

**ERIE CITY IRON WORKS • ERIE, PA. • *Since 1840***

# WHICH MAN IS THE EXPEDITER?

Customer, sales engineer, production manager — all three have a direct influence on the speed with which a switchgear order can be produced and delivered.

But the customer can be most influential by far!

For if he is an experienced buyer, he selects standard arrangements assembled from standard components — and in this way materially speeds engineering, order entry and production. Further, since standard construction evolves from expressed preferences based on the actual experience of thousands of users like himself, he obtains the best possible equipment at the lowest possible cost.

**To speed your switchgear delivery**

*Let your I-T-E representative show you how standard components can be used for your requirements!*

I-T-E

R&IE

## For *more dependable* Switchgear

*specify I-T-E!*

I-T-E Circuit Breaker Company • 19th & Hamilton Streets • Philadelphia 30, Pa.

Power Switching Equipment: Railway and Industrial Engineering Co., Greensburg, Pa.

Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., New York

• SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • CIRCUIT BREAKERS • MECHANICAL RECTIFIERS • RESISTORS • SPECIAL PRODUCTS •

# FOR QUICK, EASY and DEPENDABLE TEMPERATURE SETTINGS... the NEW LESLIE Calibrated Dial is the Answer!

LESLIE Temperature Regulator
Class MCC—1 *(with Calibrated Dial)*

THE new **CALIBRATED DIAL** now available on Leslie Class T and Class M type Temperature Regulators provides quick, easy, and dependable temperature settings. A simple turn of the dial to the temperature desired is all that is needed.

This calibrated dial adds the following features to those which already make Leslie Temperature Regulators a great value:

★ **TIME SAVING**—*Just turn the dial to desired setting—no need to wait for equipment to heat up to find out if setting is correct.*

★ **SAFE**—*Avoids costly overheating caused by guess setting.*

★ **RUGGED**—*Designed for production line use where frequent dependable readjustments are necessary for process work.*

★ **SIMPLE**—*Fits in place of standard adjusting sleeve. No complicated linkages or gages to go out of order or add friction.*

Calibrated Dials are easily installed on Class T and Class M Regulators already in service.

LESLIE engineers are available by phone, mail or personal calls to give recommendations on your temperature regulation problems.

**SEND FOR**—copy of
**Temperature Regulator Bulletin No. 464B**

50th Anniversary 1900—1950

*Lowest Overall Cost per Operating Year*

Look for LESLIE REGULATORS under "Valves" or "Regulators" in your classified telephone directory in the following cities where LESLIE factory trained engineers are located:

| | | | | | |
|---|---|---|---|---|---|
| Albany, N. Y. | Buffalo, N. Y. | Greensboro, N. C. | Milwaukee, Wis. | Pittsburgh, Pa. | Savannah, Ga. |
| Albuquerque, N. M. | Chicago, Ill. | Greenville, S. C. | Minneapolis, Minn. | Ponca City, Okla. | Seattle, Wash. |
| Atlanta, Ga. | Cincinnati, Ohio | Houston, Texas | Mobile, Ala. | Portland, Ore. | St. Louis, Mo. |
| Baltimore, Md. | Cleveland, Ohio | Kansas City, Mo. | Monroe, La. | Providence, R. I. | Syracuse, N. Y. |
| Beaumont, Tex. | Denver, Colo. | Kingsport, Tenn. | New Orleans, La. | Richmond, Va. | Tucson, Ariz. |
| Birmingham, Ala. | Des Moines, Iowa. | Los Angeles, Calif. | New York, N. Y. | Rochester, N. Y. | Wilkes-Barre, Pa. |
| Boston, Mass. | Detroit, Mich. | Louisville, Ky. | Orlando, Fla. | Rutherford, N. J. | Wilmington, Calif. |
| Bridgeport, Conn. | Duluth, Minn. | Memphis, Tenn. | Philadelphia, Pa. | San Francisco, Calif. | Youngstown, Ohio |

Montreal, Que., Can. Toronto, Ont., Can. Vancouver, B.C., Can. Bruxelles-Forest, Belgium

ESTABLISHED 1900
LESLIE CO.
718

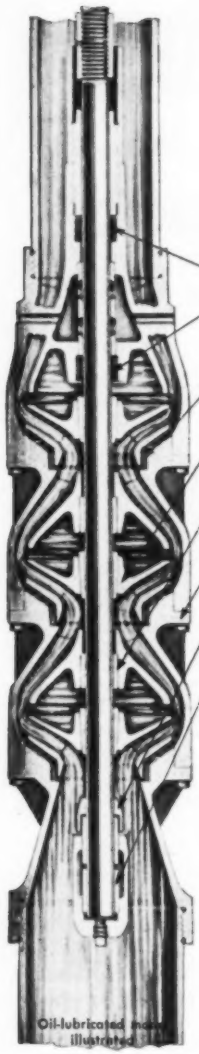
263 Grant Avenue, Lyndhurst, New Jersey

*FLOATLESS LEVEL CONTROLS • PRESSURE REDUCING VALVES • PRESSURE CONTROLLERS
SELF CLEANING STRAINERS • PUMP GOVERNORS • TEMPERATURE REGULATORS
• AIR HORNS • STEAM WHISTLES

*Before you buy a vertical turbine pump*

# CHECK WORTHINGTON AGAINST THE FIELD!

*Chart shows only Worthington gives you all 8 vital design-features as standard equipment*



Oil-lubricated model illustrated

**The Ten Leading Makes Of Vertical Turbine Pumps**
**√ Indicates Feature Is Standard**

| Standard Features | Worthington Type Q | Pump A | Pump B | Pump C | Pump D | Pump E | Pump F | Pump G | Pump H | Pump I |
|---|---|---|---|---|---|---|---|---|---|---|
| Seals above and below drain ports (oil-lubricated model) | √ | | | | | | | | | |
| Wearing rings | √ | | | | √ | | | √ | | |
| Enclosed impellers | √ | √ | √ | √ | √ | √ | | √ | √ | √ |
| Bronze bushings in bowl assembly | √ | | √ | √ | √ | √ | | √ | √ | √ |
| Flanged and bolted bowls on all sizes | √ | | | | | | √ | | √ | √ |
| Sand collars at both ends of bowl assembly (water-lubricated model) | √ | √ | | | | | | | | |
| Grease-packed bottom bearing | √ | √ | | | √ | | | | | √ |
| Choice of oil or water lubrication | √ | √ | √ | √ | √ | √ | | √ | | |

There's your quick, complete picture of how Worthington Type Q stocks up against competition. Remember — each of the features listed is a proved aid to more efficient pump performance. And only Worthington gives you all of them as standard!

*Why settle for anything less than this all-inclusive, ahead-of-the-parade design that assures smoother, lower-cost pumping?*

**Maximum Head In All Sizes**

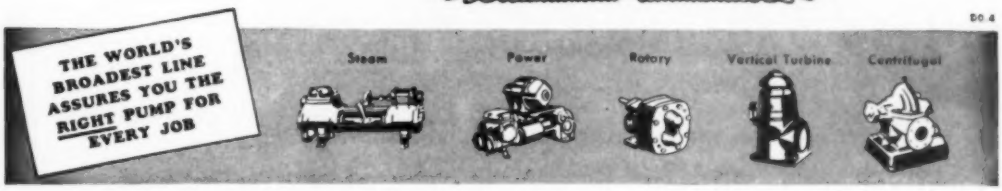
Available in sizes from 6" to 32", Worthington Type Q Vertical Turbine Pumps handle liquids at temperatures of 7° below zero F to 500°F, with maximum head per stage over the entire size range.

See your local Worthington dealer for the whole story that proves *there's more worth in Worthington*. Complete manufacturing and servicing facilities at Denver, Colo., and Harrison, N. J. *Worthington Pump and Machinery Corporation, Harrison, N. J., Denver 16, Colorado.*

*Dealer Franchises Open*

# WORTHINGTON

D0.4



*A brilliant new chapter in Bell & Zoller's story of 65 years of service to coal users!*

# 4 MORE MINES JUST ADDED

**Increasing our coal-production capacity to an all-time high . . .**

## 2½ Million More Tons of Select Coal Annually!

**Bell & Zoller assures you of more and better coals always!**

Yes, the acquisition of four famous Illinois mines formerly owned by Consolidated Coal Company, the Buckhorn, Nason, Mount Olive and Staunton mines, raises our coal-producing capacity to the highest level in history and enables us to offer you an even more diversified selection of top-quality brand coals.

**NOW** { **9 Mines**
**3 Large, Modern Washing Plants**
**5½ Million Tons Annual Production**

Today, in addition to our famous Zeigler, Oriole, Moss Hill and Murdock brands, we offer you well-known Buckhorn, Jeffco, Mount Olive and Staunton coals—your choice of an even greater supply of select Southern and Central Illinois coals, plus top quality products from the finest fields in Western Kentucky.

We are certain our present customers will welcome our expanded facilities and production capacity. And we sincerely hope that former customers of Consolidated Coal Company will make use of our complete services and facilities, and continue to specify Buckhorn, Jeffco, Mount Olive and Staunton coals. Whether you're a new, old or prospective buyer of Bell & Zoller Coals, you can count on us to deliver *more and better coals always.*

COOPERATING MEMBERS COAL HEATING SERVICE

## BELL & ZOLLER COAL COMPANY

BELL BUILDING, CHICAGO 1, ILLINOIS

*ST. LOUIS • NASHVILLE • OMAHA • MINNEAPOLIS*

*Sixty-Five Years of Service to Coal Users*

**Producers of**
**ZEIGLER, MOSS HILL, ORIOLE, MURDOCK, JEFFCO, BUCKHORN, MOUNT OLIVE and STAUNTON Coals**

*Sales Agents for*
Mulberry Hill Coal Company
Freeburg, Illinois

Otter-Eagle Coal Company
Lockwood, West Virginia

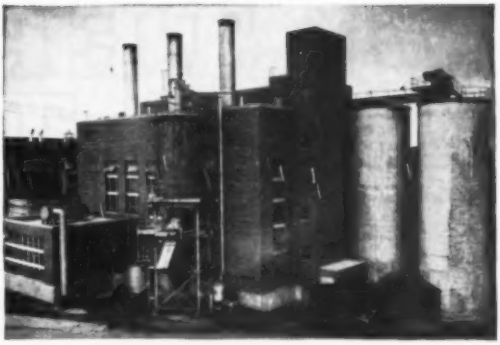
Boone County Coal Corporation
Sharples, West Virginia

# WE KNOW
## COSTS CAN BE CUT

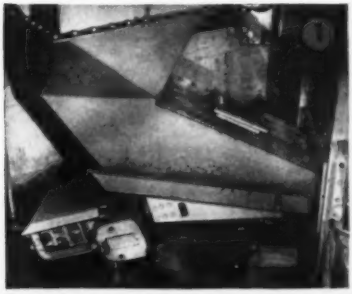
**Started up almost a year ago, our NEW Steam Generating Plant (three 60,000 lb. per hr. boilers) is showing savings far exceeding expectations. Better thermal efficiency, generous savings in generating cost and reduced man-hours per year contribute to the over-all practicability of this new boiler house.**

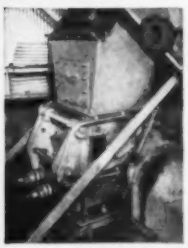
**No glass house for us . . . dustless Coal Handling is provided by the use of Jeffrey equipment. Coal is speeded on its way from Track Hopper to Vibrating Feeder (No. 1) to Scraper Conveyor (No. 2) to FLEX-TOOTH Crusher (No. 3) (or by-passed) to Bucket Elevator (No. 4) to Spiral Conveyors (No. 5) . . . thence to bunkers or silo storage. All Jeffrey including the Weigh Larries (No. 6).**

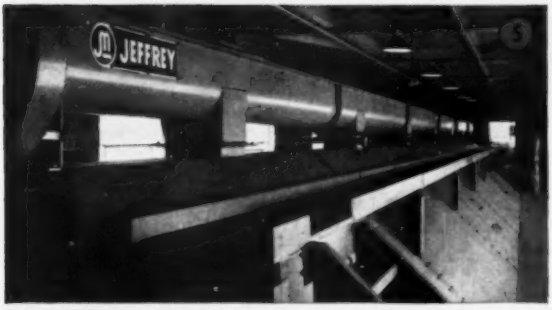
**WE KNOW—SAVINGS CAN BE INCREASED—with Jeffrey Coal and Ashes handling machinery. Let us prove it.**

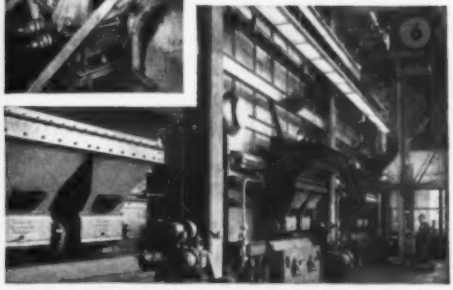


*Above: Exterior view of the new plant—more modern and practicable than most.*



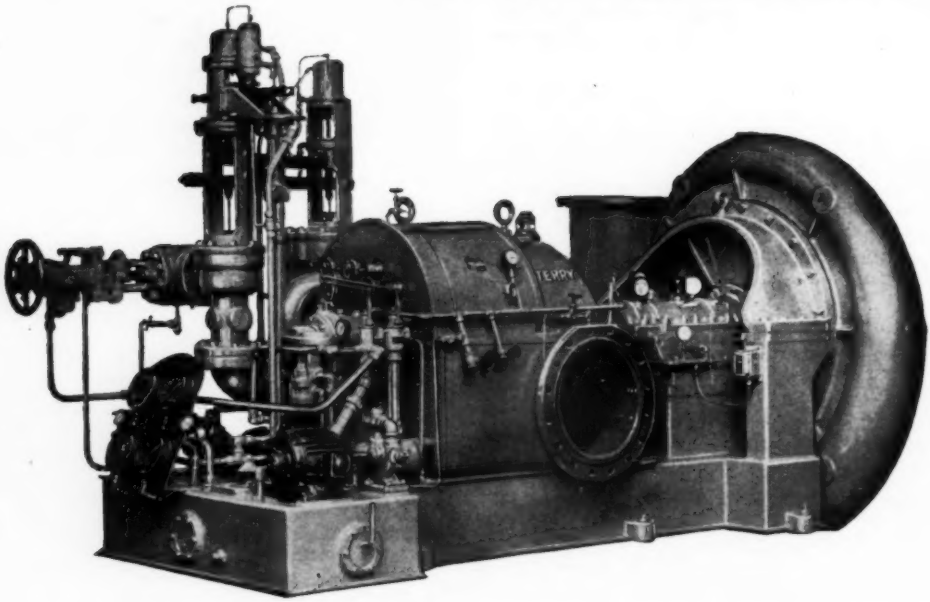




THE JEFFREY MANUFACTURING COMPANY
814 North Fourth St., Columbus 16, Ohio
ESTABLISHED 1877
Complete Line of Material Handling, Processing and Mining Equipment
Jeffrey Mfg. Co. Ltd., Montreal, Canada
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S.A.
British Jeffrey-Diamond Ltd., Wakefield, England
The Galion Iron Works & Mfg. Co., Galion, Ohio

# *The* TERRY TURBINE



## SPECIAL PURPOSE TURBINE

**FOR OPERATION UNDER ALL THESE CONDITIONS:**

1. Straight, high-pressure, condensing
2. Straight, low-pressure, condensing—putting to work excess low-pressure steam.
3. Mixed pressure — using the low-pressure steam available, with only enough high-pressure steam required to drive the compressor
4. Condensing bleeder operation — providing clean, low-pressure steam for heating or process work

. . . and the speed under any of these conditions can be varied from 2800 to 4750 rpm.

This is but one example of many unusual combinations developed by Terry to meet out-of-the-ordinary requirements in turbines up to 2000 hp. Information on a special-purpose turbine for your specific requirements will be gladly furnished.

T1177

**THE TERRY STEAM TURBINE COMPANY**
**TERRY SQUARE, HARTFORD, CONN.**

# WHY seat misalignment doesn't cause this Darling Valve to leak!

NO gate valve body ever made is entirely immune to distortion caused by line stresses and temperature changes. Yet even slight distortion can throw the seats out of alignment—probably the most common cause of leaky valves and costly replacement.

That's one reason why Darling gate valves, with their unique wedging principle combined with fully revolving double discs and parallel seats, have the jump on other valves. They easily, *automatically* adjust for valve body distortion, cinching tight, leak-proof closure without destructive strong-arm tactics. Most important, you avoid costly down-time and repeated maintenance headaches.

But that's not all! Actually, this Darling principle offers several other equally important time-and-money-saving advantages. In plant after plant they add up to trouble-free performance and longer service life with a very minimum of attention.

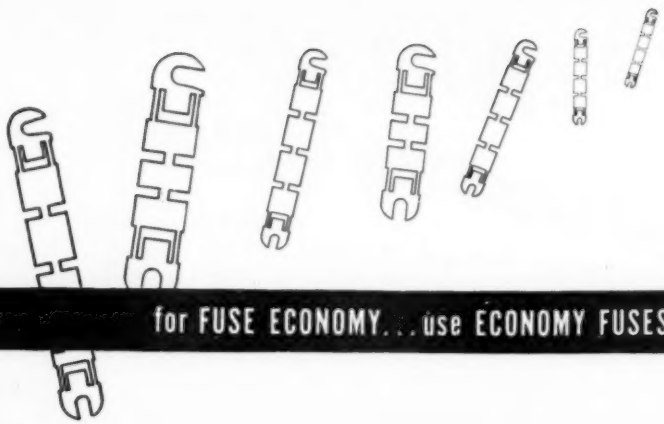
**GET ALL THE FACTS**

Send for descriptive cast steel valve Bulletin No. 5003.

**DARLING VALVE & Manufacturing Co.**
**WILLIAMSPORT 9, PA.**

**NOTE:** *Darling gate valves are made in a wide range of sizes, types and constructions, including solid and slotted taper-seat wedge types, for all kinds of normal and corrosive services in pressures up to 1500 pounds.*

**FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN**



for FUSE ECONOMY... use ECONOMY FUSES

# SUREST protection at LOWEST cost

## ...and CONSERVES *precious Brass and Copper*

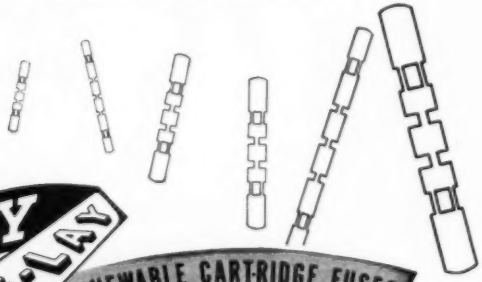
Your first investment in a metal-conserving "ECONOMY DE-LAY" Renewable Fuse is reasonable—and you save a lot of money every time you have a "blow". Because you simply remove the blown link and replace it with a new, inexpensive "ECONOMY DE-LAY" Renewal Link in the same cartridge.

This restores the fuse to its original efficiency, at a cost of only a few cents for each "blow".

You can't buy any other type of fuse protection that "serves" you so well, and costs so little.

Your Electrical Wholesaler has "ECONOMY DE-LAY" Renewable Fuses and Renewal Links in stock.

*Ask for the* ECONOMY *Catalog and Price List.*



ECONOMY DE-LAY RENEWABLE CARTRIDGE FUSES

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ECONOMY FUSE AND MFG. CO., 2717 GREENVIEW AVE., CHICAGO 14, ILLINOIS REPRESENTATIVES IN ALL PRINCIPAL CITIES

No location problems—works underneath streets, parks, etc.

No well too deep—motor-pump unit is submerged.

Speed is not limited—motor is close coupled to pump.

Silent operation.

Crooked wells are no problem.

Saves valuable space—no surface motor or pump house.

THE BJ SUBMERSIBLE PUMP HAS IMPORTANT INSTALLATION ADVANTAGES NOT OFFERED BY ANY OTHER PUMP

Safe against vandalism.

Capacities to 20,000 gpm. Heads to 1500 ft.

No water contamination by dirt, oil, or foreign matter.

Can work beneath ice and away from atmospheric changes.

Unaffected by floods.

Get the full story on how BJ Submersibles can answer your needs . . . send the coupon now!

**Byron Jackson Co.**

*Since 1872*

P.O. Box 2017, Terminal Annex, Los Angeles 54, Calif.

*Offices in Principal Cities*

Precision assembled at factory—installed without adjustments.

Installation is easy.

BJ PUMP DIVISION, DEPT. 61

Please send me full information on the BJ SUBMERSIBLE.

NAME_____

CO. or DEPT._____

ADDRESS_____

CITY_____ STATE_____

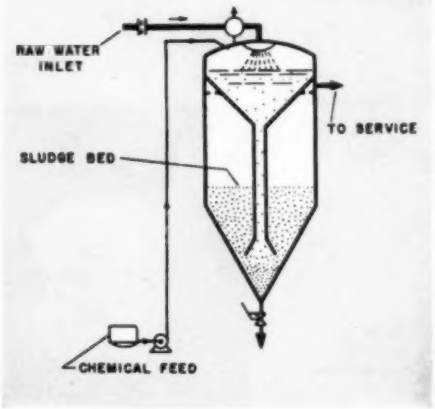
# *Effective Removal of*

# $SiO_2$

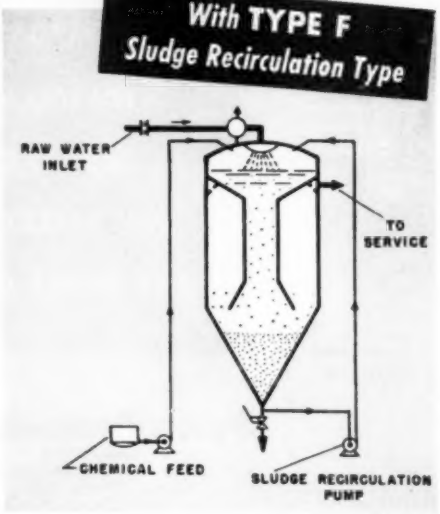
**(SILICA)**

## FROM FEEDWATER

**With TYPE S Sludge Contact Type**




**With TYPE F Sludge Recirculation Type**




You can be sure of the precise degree of silica removal best suited for your particular plant needs, whether you operate high pressure or moderate pressure boilers with one of Graver's two basic types and more than 16 standard designs of hot process softeners.

In the Graver type S softener, intimate and prolonged contact of the raw water with silica absorbing magnesium oxide is provided by passing the water upward through a deep dense sludge bed.

This contact with sludge also removes organic matter while completing the softening action on the water.

In the Graver type F softener, complete removal of silica, even with extremely variable loads and unusual water conditions, is assured by recirculating the sludge containing magnesium oxide, which is the active material for silica removal.

In all Graver hot process softener designs, the exceptionally low rising rate of treated water from the sludge bed to the discharge, due to the special downcomer design pioneered by Graver . . . half the rising rate in other designs . . . provides clearest treated water and least load on filters.

***Write for 36 page bulletin describing Graver hot process softeners in detail.***

GRAVER

**GRAVER WATER CONDITIONING CO.**

*Division of Graver Tank & Mfg. Co., Inc.*

216 WEST 14TH STREET, NEW YORK 11, N. Y.

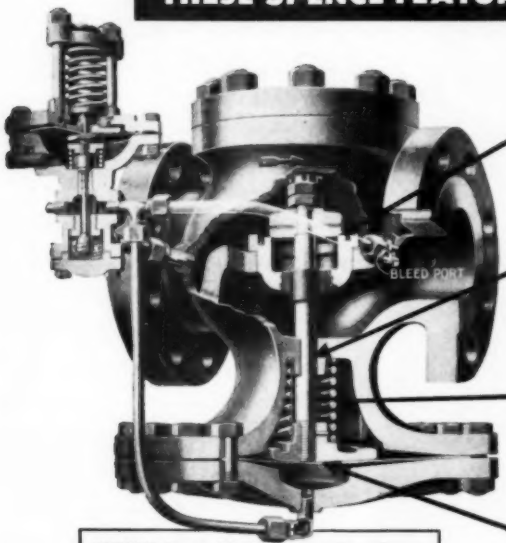
CHICAGO • PHILADELPHIA • CLEVELAND

GW-436

HERE'S PROOF

# You Can Cut Costs of Pressure and Temperature Control

## THESE SPENCE FEATURES SHOW YOU HOW




SPENCE Type ED Pressure Regulator

**SECO METAL SEATS AND DISCS** — Durable SECO Metal resists wiredrawing. More than twenty years of experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

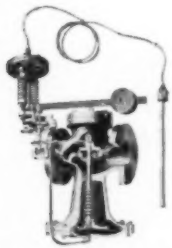
**PACKLESS CONSTRUCTION** — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

**SPRING OUT OF PATH OF STEAM** — The spring in the Spence Regulator is out of the path of the steam or other fluid flowing through the valve. It operates at low unit stress for exceptionally long life.

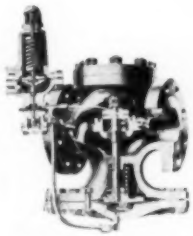
**LARGE BALANCED DIAPHRAGM**—Spence metal diaphragms, under usual conditions, never require replacement. Spence Regulators have few moving parts and those few are ruggedly constructed and seldom require attention.

YOU BENEFIT by these and many other Spence features that assure *accurate, dependable* regulation year after year. That means *less down-time, less time and money wasted on replacement of parts.*

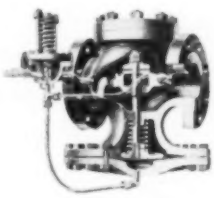
Spence Pressure and Temperature Regulators are built in sizes from *¼" to 12"* for service with *air, steam, water, oil or gas.* Only minor adjustments are needed to switch any Spence Regulator from one service to another.



Type ET150 Temperature Regulator—Tops in performance for both storage and instantaneous heaters.



Type EN Differential Regulator—Accurately controls differential between fluid delivered by regulator and some other source of pressure connected to the pilot spring chamber.



Type EQ Back Pressure Regulator — Completely packless, pilot operated for accurate control of the initial pressure.

## These Companies Have Profited with SPENCE!

The Springs Cotton Mills
Ford Motor Company
Pennsylvania Power & Light Company
Jones & Laughlin Steel Corporation
National Tube Company
The Atlantic Refining Company
Great Lakes Steel Corporation
Todd Shipyards Corporation
Land O'Lakes Creameries, Inc.
General Electric Company
R. J. Reynolds Tobacco Company
Ohio Edison Company

**and thousands of others**

**SPENCE ENGINEERING COMPANY INC.**
**WALDEN, NEW YORK**

Spence

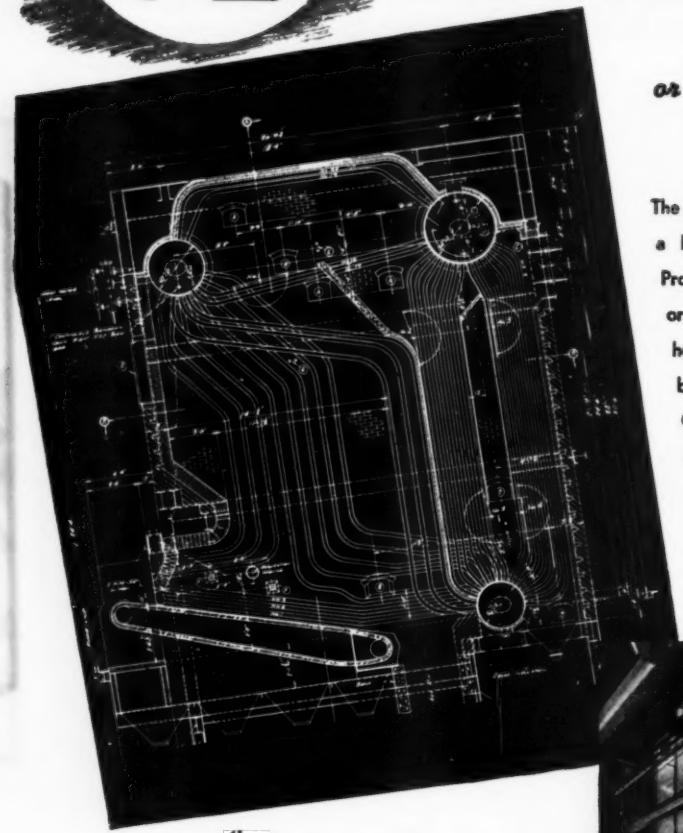
CLASS VL

# Vogt

# Steam Generating Units

## *for* POWER *or* PROCESSING LOADS, *and* HEATING

The design provides large furnace volume and a high ratio of radiant heating surface. Proper combustion is assured with any fuel or method of firing. Superheaters, air preheaters, economizers, water walls, and soot blowers can be readily incorporated. Vogt Class VL Steam generating units are giving satisfactory service in Hotels, Sugar Refineries, Steel Mills, Furniture Factories, Distilleries, Oil Refineries, and related industries. A bulletin showing typical installations will be sent upon request.



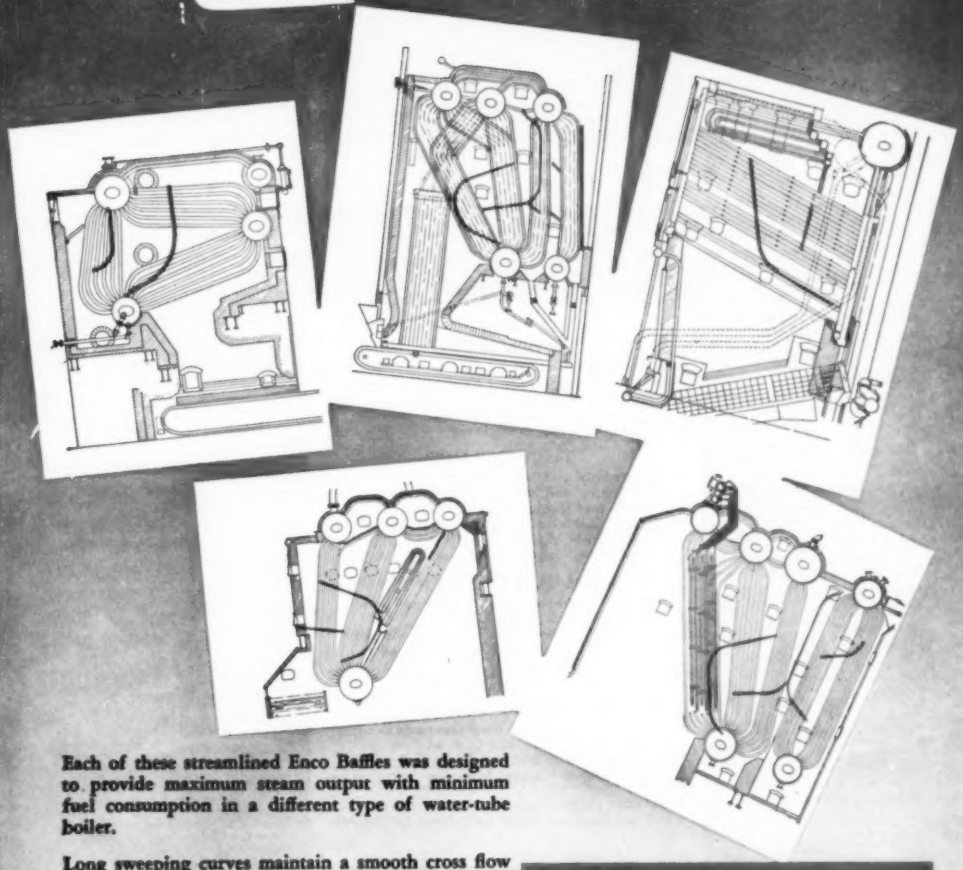
*Above:*
This 90,000 lbs. steam per hour unit, designed for 475 lbs. pressure, serves the Mansfield Tire & Rubber Co., Mansfield, Ohio.

*Right:*
Two 515 H.P. units installed in Brown-Forman Distillers Corporation, Louisville, Ky. Plant.

**HENRY VOGT MACHINE CO. • 1000 W. Ormsby St., Louisville 10, Ky.**
**Branch Offices: New York, Philadelphia, Cleveland, Chicago, St. Louis, Dallas**

# *Streamlined for Savings*

## IN EVERY TYPE OF BOILER



**Each of these streamlined Enco Baffles was designed to provide maximum steam output with minimum fuel consumption in a different type of water-tube boiler.**

**Long sweeping curves maintain a smooth cross flow of gases across every square foot of heating surface. Eddy currents, bottlenecks and dead gas pockets are eliminated—draft losses are cut to a minimum. Soot blowers work more effectively, less steam and less time are needed for cleaning.**

**Enco Streamline Baffles are individually designed and engineered to the exact requirements of your boiler. Experienced Enco-trained crews take charge of the installation.**

**The 18-page Enco Bulletin, BW44, shows how engineers throughout industry have gotten higher boiler efficiency and increased steam production through the use of Enco Streamline Baffles. Why not write for your FREE copy today?**

*The Engineer Company Produces:*

**ENCO OIL BURNERS**

**ENCO FUEL OIL PUMPING AND HEATING UNITS**

**ENCO AUTOMATIC OIL-ELECTRIC IGNITION SYSTEM**

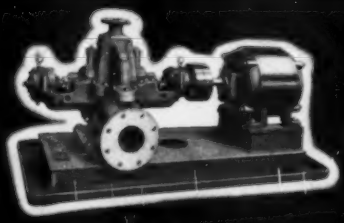
**ENCO AUTOMATIC COMBUSTION CONTROL**

**THE ENGINEER COMPANY**

75 WEST STREET, NEW YORK 6, N. Y.

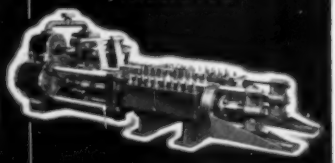
Canadian Representative:
F. J. Raskin, Ltd., 370 Rachel E., Montreal, P. Q.

Warren-Quimby
Gear-in head Screw Pump



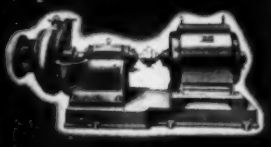
Warren Condensate Pump

Warren Horizontal Duplex
Hydraulic Pump



# WARREN PUMPS

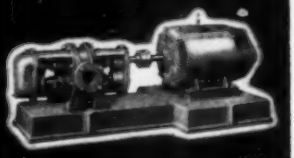
*Maintain efficiency • Operate at low cost • Are long-lived*



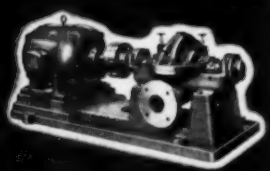
Warren Type "L" Single-Stage
Single-Suction Liquor Pump

**CENTRIFUGAL**
Single and Multi-stage
Pressure range: Up to 1200 P. S. I.
Capacities: Up to 50,000 G. P. M.
Types: Horizontal and Vertical
Impellers: Open or Enclosed

**RECIPROCATING**
Horizontal and Vertical Single Piston
Horizontal and Vertical Duplex Piston
Single and Duplex Outside Packed Plunger
Single, Duplex and Compound Hydraulic
Steam Heat Vacuum
Automatic Pump and Receiver, etc., etc.,



Warren-Quimby External Gear
and Bearing Rotex Pump



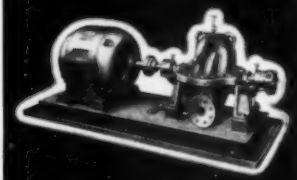
Warren Type DBL, Single-Stage
Double Suction, Centrifugal Pump

**WARREN-QUIMBY SCREW PUMPS**
Gear-in-head and External Gear and Bearing
Capacities: Up to 3000 G. P. M.
Pressures: Up to 200 P. S. I. on low viscosity liquids; practically unlimited on high viscosity liquids
Horizontal or Vertical Mounting

**WARREN-QUIMBY ROTARY PUMPS**
Gear-in-head and External Gear and Bearing
Capacities: Up to 1000 G. P. M.
Pressures: Up to 250 P. S. I.
Horizontal or Vertical Mounted

*Send your pumping problem to us, Warren Engineers will recommend the right pump for the job.*

P-28



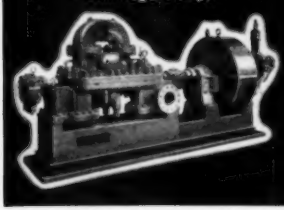
Warren Two-Stage Volute
Centrifugal Pump

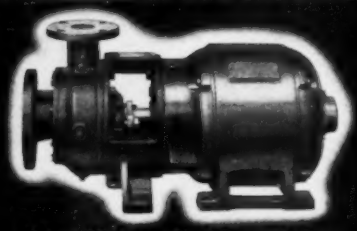
WARREN
QUIMBY PUMPS

## WARREN STEAM PUMP COMPANY, INC.

WARREN, MASSACHUSETTS

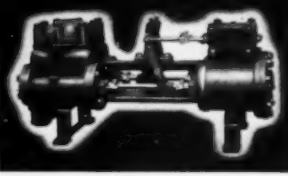
Warren 4- and 6-Stage
Centrifugal Pumps





Warren "Compacunit"—4 Types—42 Sizes

Warren Horizontal "Realwear"
Duplex Piston Pump



## *Longer life in severe service from*

# MONEL
# "K" MONEL
## PUMP PARTS

Corrosion, erosion, wear, fatigue . . . pump parts must stand up to *all* these destructive forces if satisfactory service is to be achieved.

In particular, where corrosive liquids must be handled . . . salt water, crude oil, chemical solutions . . . the selection of proper materials often spells the difference between weeks and *years* of service.

Leading makers and users of pumping equipment have found that pump life can be greatly extended, often tripled and quadrupled, when vulnerable parts are made of *Monel*® or *"K"*® *Monel*.

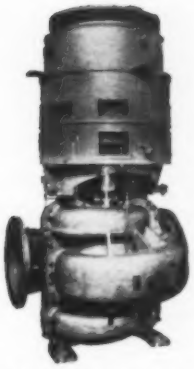
These two INCO alloys are highly resistant to corrosion by salt water and most commonly-encountered industrial chemicals. In addition, they possess strength and hardness equal to that of structural steel. Both alloys are machinable, and are produced in standard mill forms. Moreover, Monel is readily castable.

*"K" Monel* differs from *Monel* in that it may be heat-treated to attain maximum properties, either before or after machining. This feature makes *"K" Monel* an ideal metal for shafts, sleeves, and other highly stressed machine members, while *Monel* is at its best in impellers, valve parts, strainers, and piping.

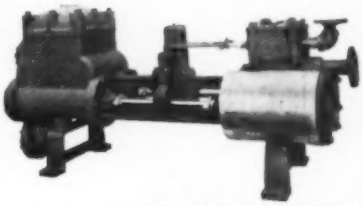
The International Nickel foundry at Bayonne, N. J., has been casting Monel pump parts for more than 40 years. Among recent technical advances is an improvement in the as-cast surface of sand castings. Shrouded impellers, for example, are now cast with a surface so smooth that pump manufacturers report up to 75 per cent less labor time required for hand filing. The INCO foundry also produces centrifugal castings for shaft sleeves, cylinder liners and pump rings.

The supply of nickel alloys has necessarily been diverted to meet defense needs. However, firms now in defense work *and* those planning for future production will be interested in "How to Get Longer Service From Your Pumps". Write to INCO for your copy.

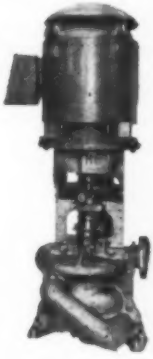
**THE INTERNATIONAL NICKEL COMPANY, INC.**
*67 Wall Street, New York 5, N. Y.*



24-inch main condenser circulating pump with a capacity of 15,000 g.p.m. at 25-foot head. Shafts are heat-treated "K" Monel.



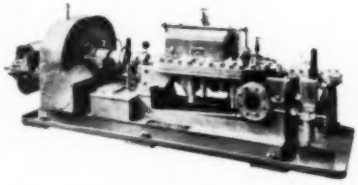
Horizontal duplex low-pressure feed pump, 7½ in. by 5 in. by 10 in. Operating pressure is 250 psi. Piston rods and valve rods are Monel.



3-inch main condensate pump handling 225 g.p.m. at a head of 180 ft. Impellers are Monel, cast at Inco's Bayonne foundry.

2-inch condensate and drain transfer pumps, handling 100 g.p.m. at a 140-ft. head. Cast Monel impellers were produced by Inco's Bayonne foundry.

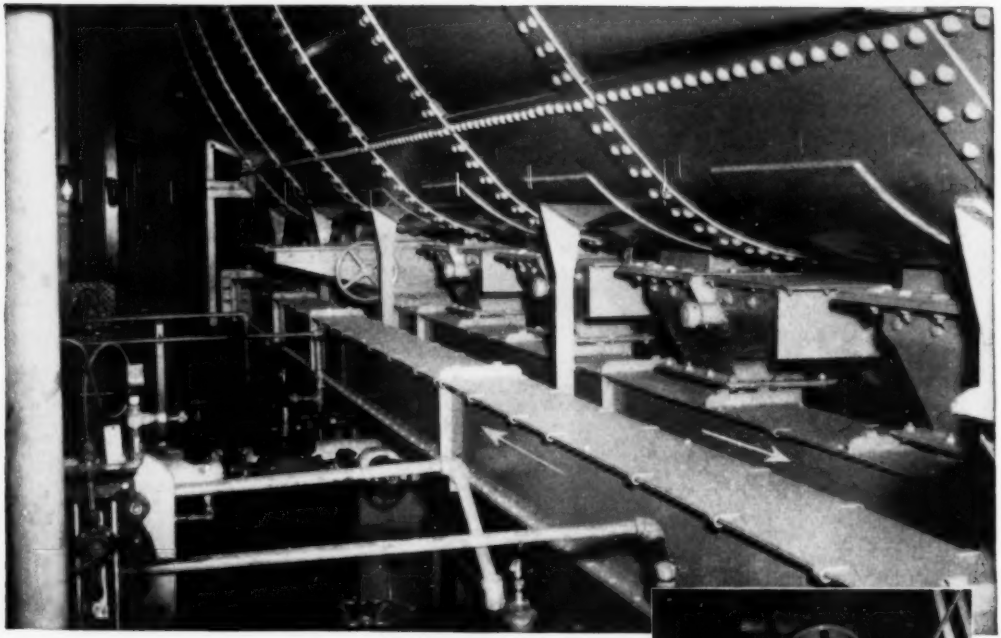
All pumps illustrated were manufactured by: WARREN STEAM PUMP COMPANY, INC. Warren, Mass.

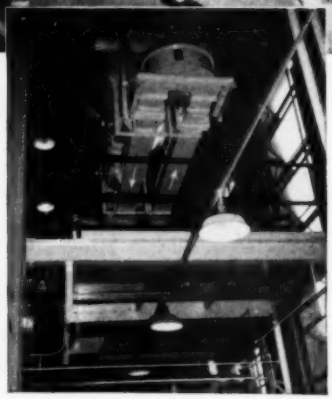


2½-inch, six stage feed pump, driven by a 210 H.P. turbine. Pump delivers 300 g.p.m. of feed water at a discharge pressure of 725 psi, equivalent to a head of 1770 ft. Shaft sleeves are Monel. Impellers are cast Monel, produced by Inco's Bayonne foundry.

EMBLEM OF SERVICE
INCO
TRADE MARK

**MONEL . . . for Minimum Maintenance**





# "SPECIAL DELIVERY"
# "SPECIAL HANDLING"

## for Coal Conveying at
## AMERICAN TOBACCO CO.

**Keeping a boiler house as neat as your wife's kitchen was one aim in designing this installation. It was achieved by a horizontal S-A REDLER Conveyor, mounted high up under the bunker, requiring no floor space.**

**But two important special requirements were also met: 1st, "special delivery" of every pound of coal from bunker to scales from any part of the bunker—no dead storage areas; 2nd, "special handling" from eleven gate-controlled bunker outlets to the enclosed dust-confining REDLER. In a closed circuit, coal circulates to discharge as needed at two scales and then by gravity directly into boiler stokers at floor level.**

**Such careful experienced design of coal and ash handling systems can be expected of Stephens-Adamson because of the complete line of equipment and half-century experience behind the engineering staff. When you think of any change in your present layout or operation, think of S-A. Write us for recommendations.**

AMERICAN TOBACCO CO.
LOUISVILLE, KY.

*Totally enclosed REDLER Conveyor 52 ft. long with 180° bend corners runs in a closed circuit directly below high bunker. S-A totally-enclosed gates at eleven chutes reclaim all coal from any part of long bunker to one run of the REDLER. Circulating until called for, coal then drops from either of two gate-controlled outlets to scales. Advantages: Dead storage areas eliminated—dust is kept within REDLER casing, boiler house clean—all coal continuously available—compact installation with minimum alteration of existing structures.*

1901-1951

*50 years experience with bulk handling*

**STEPHENS-ADAMSON MFG. CO.**

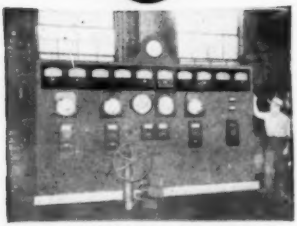
21 Ridgeway Avenue, Aurora, Illinois · Los Angeles, Calif. · Belleville, Ontario

**DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT**

"dag" Colloidal Graphite Lubricates
where Ordinary Lubricants Fail
At temperatures below zero, and up to 5000° F. in inert atmospheres, "dag" colloidal graphite is a lubricant that does not gum up . . . that defies break-down . . . that fights friction constantly. Easy to apply, too, by spray or brush.
"Dag" colloidal graphite is electric-furnace graphite specially processed by Acheson to make its particles microscopic in size, and far more slippery and durable than conventional petroleum lubricants. It is dispersed in a variety of organic and inorganic carriers for positive transmission to the zone of heat and for effective concentration there.
"Dag" colloidal graphite is available in dispersions designed to lubricate under all conditions of deep piercing, forging, stretch-forming, wire-drawing and ingot stripping . . . to assist in the parting of castings . . . to permanently lubricate moving parts that may be subject to extremely high or low temperatures . . . and in degreasing solutions which destroy ordinary lubricants.
More data on the advantages of "dag" colloidal graphite lubrication in metal-working operations is contained in a recent bulletin. Write for your free copy of Bulletin No. 426-17E.
dag
DISPERSIONS
Acheson Colloids Corporation
Port Huron, Mich.
...also Acheson Colloids Limited, London, England

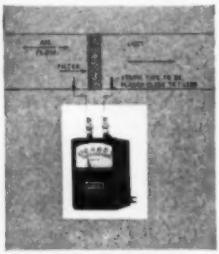
# 5 ways to use HAYS low pressure gages.

1



**Pressure and Flow Measurement in Gas Producer Plant.** In this automatically controlled gas producing plant Hays FOT Indicators show gas header pressure, stack pressure, air pressure, and air flow. The FOT is a popular pressure-flow instrument in the process industries.

2



**Resistance Measurement in Air Conditioning Systems.** The Hays air filter gage is a money-saver when used to indicate the amount of resistance through filters in air circulating systems. When equipped with open or closed switches it flashes or sounds an alarm when resistance becomes excessive.

3

**Commercial Boiler Testing** Portable easily handled Hays "B" gages are widely used for checking draft in the combustion chambers of small automatically fired boilers to assure maximum efficiency. The scales are easily read—large black figures on a light background. Gages are compact, rugged.

4

**Product Testing by Differential Pressure Measurement.** Here the simplicity of the Hays FOT indicator makes possible testing of a complicated product by unskilled workers. Hays gages were selected because of their accuracy and because they could be supplied with large, easily read scales.

5

**Continuous Draft Indication in Boiler Furnaces.** Banks of Hays "V" gages are a familiar sight in thousands of boiler rooms. They provide an accurate "picture" of furnace draft conditions at any given moment and thus warn the operator of soot deposits, slag accumulations, too thin a fire, burned out baffling, etc.

**HAYS has the most complete line of low pressure gages on the market.**

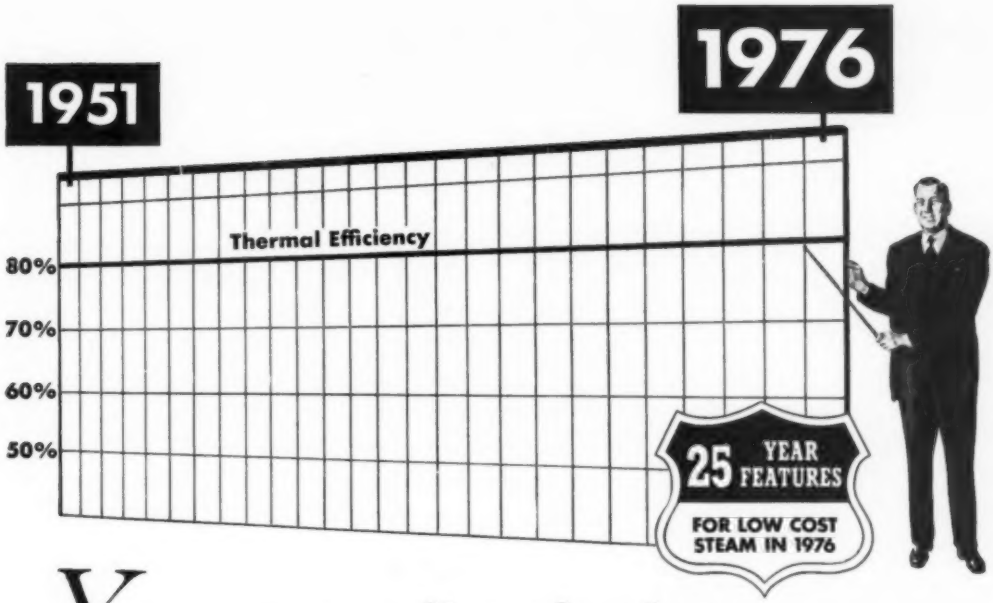
• 4 diaphragm units available for both pressure and differential • diaphragms of colon'leather or of synthetic impregnated material highly resistant to corrosive atmospheres, moisture and oxidation • 4 case sizes • as many as 12 pointers in one case • ranges from a minimum of .2" water to a maximum of 120" water • for indicating, recording, or controlling draft pressure, differential or flow • wall, lug, or flush mounting—also portable models • interior or exterior illumination • square root extractors available.

***What's your draft or pressure problem?***

Hays engineers are anxious to help you solve your low pressure measurement and gas or air flow problems. They have applied Hays gages to situations ranging from the determination of fuel oil level in marine vessels to the measurement of the density of mud in oil drilling operations. Send a description of your problem to Clarence Miller, The Hays Corporation, Michigan City, Indiana. You'll receive Hays' recommendations plus Bulletin 49-667 describing the complete line of low pressure instruments.

THE **HAYS** CORPORATION
*MICHIGAN CITY 2, INDIANA*

Automatic Combustion Control • Boiler Panels • Hays-Penn Flowmeters
Veriflow Meters and Veritrol • Gas Analyzers • Draft Gages
Combustion Test Sets • $CO_2$ Recorders • Electronic Oxygen Recorders



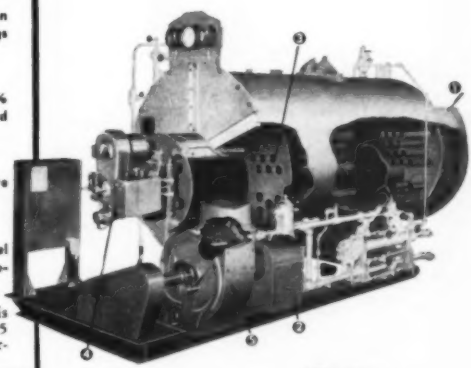

# *You can predict the future of a* **PREFERRED** *steam generator!*

You don't need a crystal ball to predict the future of a Preferred Unit Steam Generator. Take a look at Preferred's 25-year features and you will see how the Preferred unit is designed to maintain its guaranteed efficiency for a quarter of a century . . . *with a minimum of maintenance.* You can see clearly, too, what this means in terms of year-in, year-out economy. • Here's required reading for wise investors—Bulletin 1000. Write today.

**25-YEAR FEATURES***

1. Anti-stress deck for tube sheet protection.
2. Special precipitator developed by Preferred as aid to safe, clean operation.
3. Staggered tube construction—minimizes possibility of tube pitting, even at low firing rates.
4. 4700 rpm horizontal rotary oil burner with patented VOLUVALVE fuel regulation—designed and manufactured by Preferred—assures fully automatic operation even with No. 6 oil.
5. Self-cleaning induced draft fan with air cooled shaft and bearings—assures long life.
6. Down-draft gas travel for 80% thermal efficiency—proved and guaranteed.
7. Dual purging cycles for positive elimination of gas stratification.
8. 4-pass, high velocity, gas travel—minimizes tube cleaning maintenance by self-cleaning action.

* Each distinctive feature of the Preferred Unit Steam Generator is designed to give efficient, economical service for an average of 25 years, with proper care and maintenance. You benefit by better performance . . . longer life . . . lower boiler costs.



**PREFERRED UTILITIES MANUFACTURING CORP.**

1860 BROADWAY, NEW YORK 23, N. Y.

PR-106

HAVE YOU CHECKED YOUR

# PLANT PULSE LATELY ?

ELECTRO MECHANICAL TYPE EM4115 SHOWN

## AUTOMATIC VOLTAGE REGULATION WILL HELP CURE OPERATING DEFICIENCIES

# STABILINE *Automatic* EM VOLTAGE REGULATORS

**feature LOW COST and EFFICIENT OPERATION IMPROVE PERFORMANCE and REDUCE COSTS**

Increased demands on today's electrical manufacturing equipment call for maximum performance, extended parts life and reduced maintenance. When incoming line voltages fluctuate, manufacturing inefficiencies and rising costs are bound to occur. To maintain constant voltage to equipment regardless of variations in line voltage or load current, install a STABILINE Automatic Voltage Regulator type EM (ELECTRO MECHANICAL).

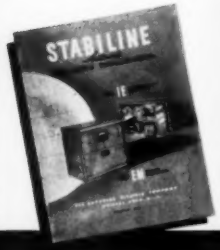
Simple and easy to install, a STABILINE type EM features high efficiency — zero waveform distortion — complete insensitivity to magnitude and power factor of load — adjustable output voltage and no critical adjustments.

| | Nom. Output Voltage | Input Voltage Range | Output Voltage Range | Output Current (Amperes) | Output KVA | Type |
|---|---|---|---|---|---|---|
| Single Phase | 115 | 95-135 | 110-120 | 17.5 | 2.0 | EM4102 |
| | | | | 52.0 | 6.0 | EM4106 |
| | | | | 130.0 | 15.0 | EM4115 |
| | 230 | 195-255 | 220-240 | 32.5 | 7.5 | EM4207 |
| | | | | 120.0 | 27.5 | EM4228 |
| | 460 | 400-520 | 420-460 | 15.0 | 6.6 | EM4407 |
| | | | | 40.0 | 17.6 | EM4418 |
| Three Phase | 230 | 195-255 | 220-240 | 25.0 | 10.0 | EM6210Y |
| | | | | 38.0 | 15.0 | EM6215Y |
| | | | | 50.0 | 20.0 | EM6220Y |
| | | | | 113.0 | 45.0 | EM6245Y |
| | | | | 175.0 | 70.0 | EM6270D |
| | 460 | 400-520 | 420-460 | 16.0 | 12.5 | EM6412Y |
| | | | | 22.0 | 17.5 | EM6417Y |
| | | | | 33.0 | 25.0 | EM6425Y |
| | | | | 66.0 | 50.0 | EM6450Y |
| | | | | 100.0 | 75.0 | EM6475Y |
| | | 420-500 | 420-460 | 131.0 | 100.0 | EM64100Y |

There's a STABILINE type EM to meet your need. Standard types are listed in the rating chart. For special requirements consult **The Superior Electric Company, 1505 Church St., Bristol, Conn.**

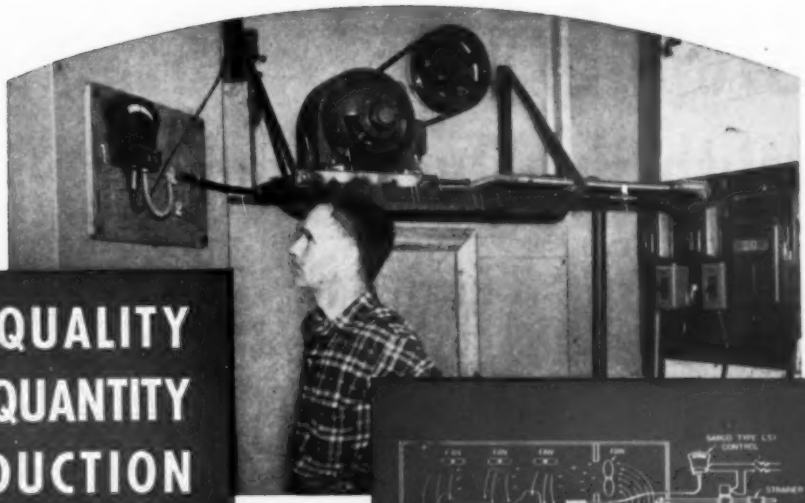
**STABILINE type IE (INSTANTANEOUS ELECTRONIC), a completely electronic unit with no moving parts, is available in ratings from 0.25 to 5.0 KVA.**

**Learn more about STABILINES type IE and EM. Write today for Bulletin S351 complete with application data, ratings, dimensions and circuit diagrams.**



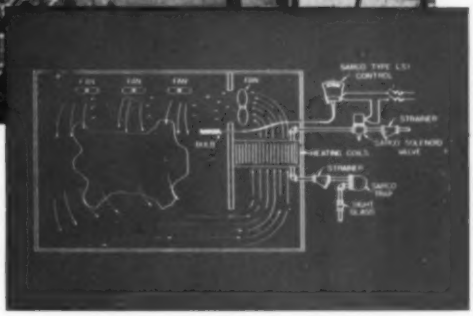

**THE SUPERIOR ELECTRIC CO.**
BRISTOL, CONNECTICUT

**POWERSTAT VARIABLE TRANSFORMERS • VOLTBOX A-C POWER SUPPLIES • STABILINE VOLTAGE REGULATORS**



# TOP QUALITY *and* QUANTITY PRODUCTION

## *for this Sarco Controlled Drying Operation*



**SARCO PRODUCTS FOR FOODS AND CHEMICALS**

Float-Thermostatic Steam Trap

Thermostatic Steam Trap

Sarco Tank Temperature Control

LSI Electric Control

Pipe Line Strainer

Thousands of dollars worth of hides pass through drying chambers every day, in this New England Tannery plant. Who can watch the thermometers and run around turning valves fast enough to prevent the hides from "burning"? Who knows whether the equipment has been run at top capacity with a minimum of precious fuel used?

No human being can claim perfection on a job like this — but Sarco can, and proves it every day on a score of different kinds of drying operations in a dozen industries.

In the plant illustrated, the inexpensive Sarco LSI increased production with the same equipment and operators — and without losing hides due to incorrect drying temperatures.

IN YOUR PLANT it may be a temperature control on hot water or a few dollars spent for individual traps on every steam coil that will boost production with less fuel, and insure a better, more uniform output. A few of the Sarco Products that do just that are shown at the left. Send us a sketch of your heating processes or ask to have the Sarco man near you look over your plant.

309

**SARCO SAVES STEAM**

**SARCO COMPANY, INC.**

*Represented in Principal Cities*

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT

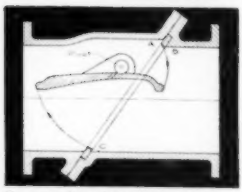
# Stop Expensive Slamming With the Cushioned Closing of CHAPMAN TILTING DISC Check Valves

Those words — *cushioned closing* — best describe the action of this unique check valve. The tilting disc works with the stream—opens easily, closes quickly, *yet quietly.* There's no slamming — no resultant destructive stresses on the pipeline.

As a result of this smooth, *cushioned action*, maintenance costs are at a minimum and savings of from 65% to 80% in head losses can be obtained over conventional-type check valves.

Send today for the bulletin describing this unusual valve.

**THE CHAPMAN VALVE MFG. CO.**
**INDIAN ORCHARD, MASSACHUSETTS**



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

# Every Minute Meant a $1920 saving

Big return for a minute's time . . . but to a leading Philadelphia manufacturer* a 5 minute interview did result in a total saving of $9600.

This manufacturer faced a problem that's common to many plants today. His ten machines have 560 bearings—560 bearings that must be kept lubricated if production is to be kept uniform, rejects few. That lubrication job was taking four man hours every week and, because of human fallibility, there was always the potential danger that one of these many bearings had been overlooked or under lubricated.

An Alemite Lubrication Engineer was called in. He made his presentation in just 5 minutes—5 minutes that saved $9600. He told the manufacturer the facts of installing a modern Alemite Centralized Lubrication System. That system is in the plant today. The result: assurance of continuous, correct lubrication, few rejects and shut downs, and the addition of a whole hour's production time every working day.

**Call Your Alemite Lubrication Engineer**

No matter what size or type of plant you operate, Alemite can show you dozens of ways to save through the more efficient handling of petroleum products. Call your local Alemite Industrial Distributor now or send for the free booklet "11 Ways to Cut Production Costs." Simply attach the coupon below to your letterhead. Dept. M-51, 1850 Diversey Parkway, Chicago 14, Illinois.

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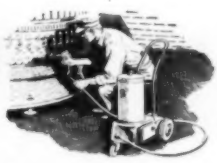

**3. In applying lubricants . . .** saves up to 23.9 man hours for every 100 pounds of lubricant applied to bearings.

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*(Simply attach to your letterhead)*
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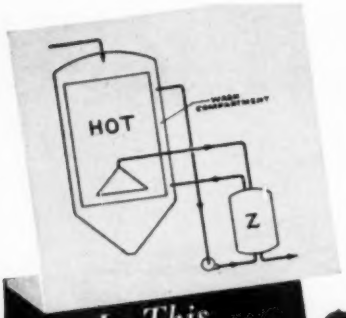
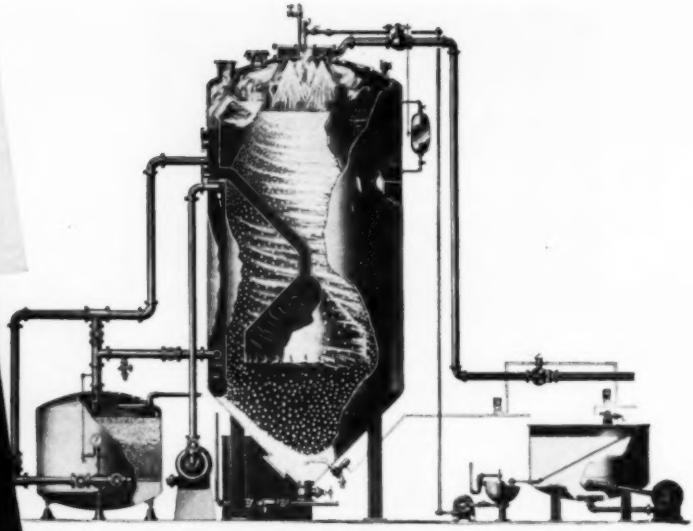



*In This* **WORTHINGTON HOT-Z** *Deaerating Type Water Conditioning System . . .*



## Built-In Annular Wash Water Compartment Supplies and Reclaims Backwash Water

## *Independent of the Softening Process*

No other Hot Zeolite System offers you so many advantages as this Worthington Hot-Z System. A quick review of the vital facts will show you why.

As you probably know, Hot Zeolite beds require periodic expansion to minimize packing and friction loss, and to insure efficient contact of each Zeolite particle with its share of dissolved impurities. This need for bed expansion occurs not only during the regeneration routine, but also several times during the period between regeneration routines. That's why it is important for you to use clean, softened water, preferably at normal operating temperature, for the reverse flow or "backwash" operation.

### Worthington does it!

The Worthington Standard Hot-Z System with its backwash feature provides a built-in annular wash water compartment that supplies and reclaims backwash water . . independent of the system's softening process. In this compartment, backwash water is cleaned and maintained at normal operating temperature.

This backwash feature pays off particularly in systems employing filters because it *makes filter beds last as long as eight years.*

### Other advantages

Worthington Hot Process Systems come equipped with modern, direct contact vent condensers. This means, no more of the scaling trouble that made the old-fashioned shell and tube types such a nuisance.

In addition, Worthington Hot-Z Systems operate on low-priced lime and salt. That's why the average installation saves enough in chemical costs to pay for itself in 3 years.

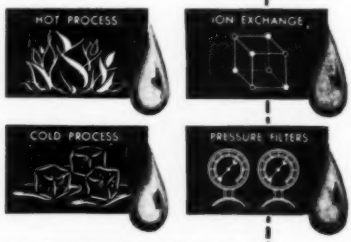
### Get all the facts!

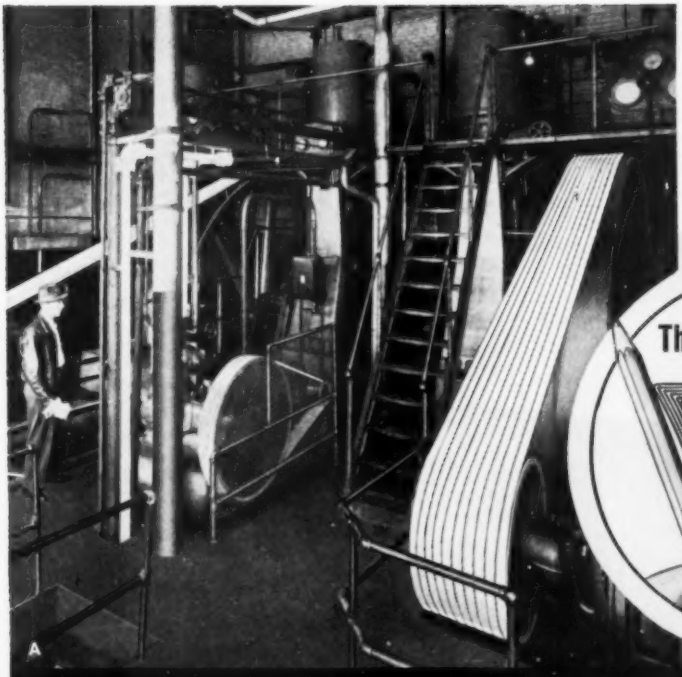
It will pay you to investigate the Worthington Hot-Z System thoroughly. Tell us your conditions of service and get our recommendation in terms of dollars and benefits. You'll find in our Hot-Z System, as in so much other equipment, *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Water Treating Section, Dunellen, N. J.*

**WORTHINGTON**

**WATER CONDITIONING**

**Worthington Makes More of the Equipment for All Types of Water Conditioning Systems**





These big compressors of the Montana Service Corp., Butte, Montana, are driven by Gates Vulco Ropes from grooved sheaves on the motors to **flat faced flywheels.** Mr. Oscar Olson, Plant Engineer, reports excellent service from these Gates Vulco Rope V-flat drives.

# *This test shows how the Concave Side gives you a real saving in V-Belt costs*

If you are interested in lower operating costs, make this simple test:—

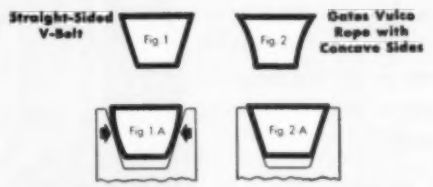
Take *any* V-belt and bend it as it bends in going around a pulley. As the belt bends, grip its sides with your fingers and thumb. You will *feel* the sides of the belt *bulge out!*

This bulging gives a straight-sided V-belt the shape shown in figure 1-A. (See diagrams at right.) Clearly, this shape does not fit the sheave groove. The sides of the bulging belt are forced to press unevenly against the V-pulley—and this concentrates the *wear* along the *middle* of the sides.

But when you bend a V-belt that is built with the *Concave Side*, you find that the sides become perfectly straight—as shown in Figure 2-A. This shape precisely fits the sheave groove.

Because there is *no bulging*, the sides of the Gates Vulco Rope always grip the *full* face of the V-pulley *evenly* and therefore wear *uniformly*—resulting in *longer belt life* and *lower belt costs for you.*

**What Happens When a V-Belt Bends**




How Straight-Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

The Concave Sides Fill Out to a Precise Fit in the Sheave Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

Only V-belts made by Gates are built with concave sides. Whenever you buy V-belts, be sure you get the V-belt with the Concave Sides—The Gates Vulco Rope!

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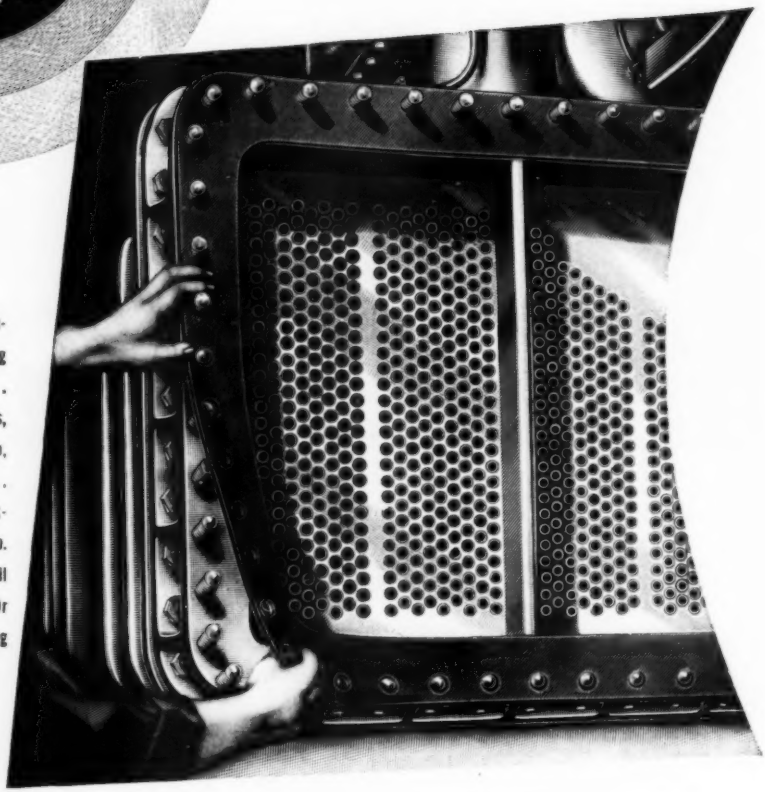

Gaskets like this for Freon condensers may not be your packing problem, but whatever it is . . . high pressures, high temperatures, chemicals, refrigerants, petroleum, food or other products . . . Raybestos-Manhattan has a packing or gasket designed for the job. Your nearby R/M distributor will help you solve your problem. Or write for the new R/M Packing Catalog.

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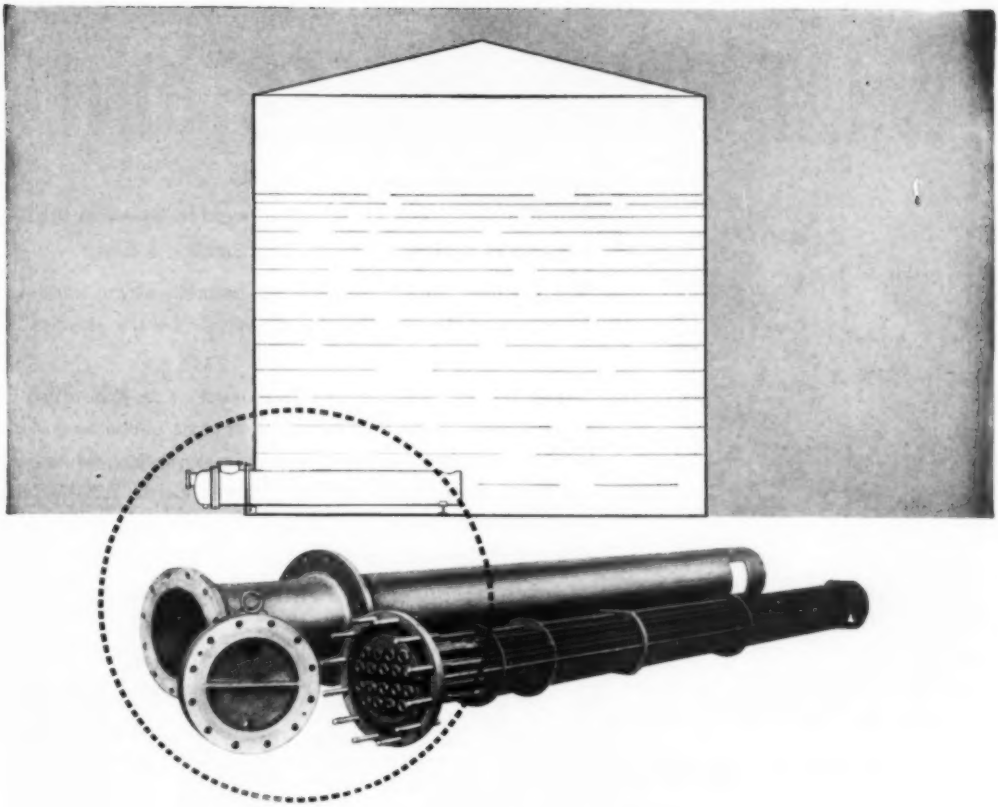

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Here is the most practical unit for heating oil to be withdrawn from storage tanks.

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The many outstanding features of this heater are based on the unequalled G-R experience of more than 80 years in the design, manufacture, and operating results of many hundreds of thousands of heat transfer units. When you buy a G-Fin Storage Tank Oil Heater, you get authoritative ratings, skillful design which is exclusive in many respects, sturdy construction with accurate machine work, and proven performance.

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For example: These Force Measuring Devices, which are the finest available, are individually calibrated and guaranteed to be accurate within one graduation mark on the gauge. This exactness is universally accepted, inasmuch as such devices simply are not expected to be more accurate. But — to John Chatillon & Sons, it represents a challenge—and full time research is constantly going on, until "Perfection"—complete and ultimate, is achieved.

**"Resting on Laurels" is an invalid phrase at Chatillon.**

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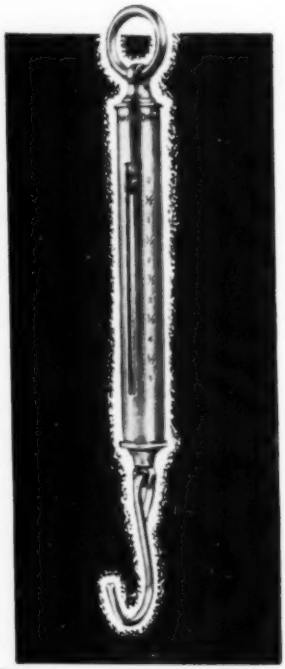

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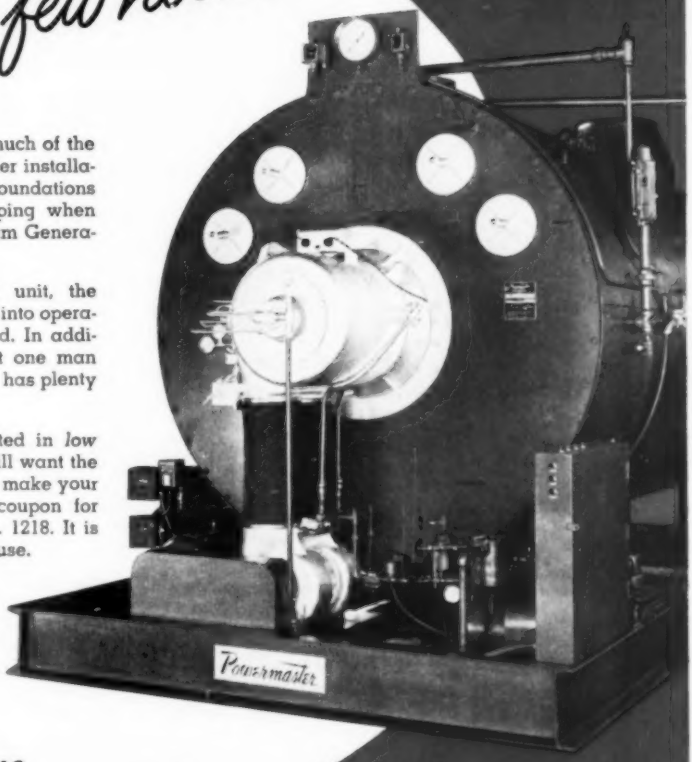
A completely self-contained unit, the *Powermaster* can often be put into operation on the day it is delivered. In addition, many users tell us that one man operates the *Powermaster* and has plenty of time for his other duties.

Then too, if you are interested in *low cost* steam generation, you will want the *Powermaster* story before you make your investment. Just return the coupon for your copy of our Bulletin No. 1218. It is full of information you can use.

To meet your special needs, the *Powermaster* is made in sizes from 15 to 500 H. P. and pressures from 15 to 200 p.s.i. You can use light or heavy oil, gas or combination gas/oil firing.

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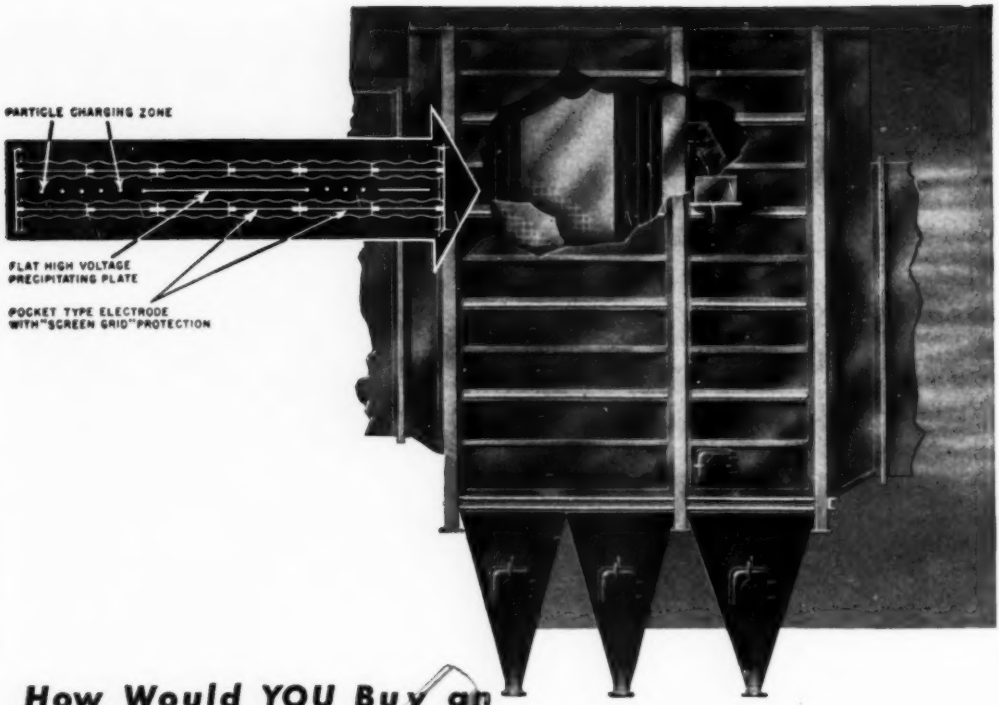


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# ELECTRICAL PRECIPITATOR?

The basic elements of all electrical precipitator units are fundamental. All require a shell or casing with an inlet and outlet, the charging electrodes, precipitating or collecting electrodes, some form of rapping device, and a high voltage power supply.

The design of these elements, however . . . and their application to the process of electrical precipitation, is the governing factor between mediocrity and startling success.

It is highly important then, that the specifying engineer thoroughly investigate the refinements and latest developments on these basic elements and their overall effect on operating efficiency of the precipitator he is considering.

An investigation will indicate that the Aerotec Electrical Precipitator is far advanced in the four basic steps of precipitation:

1. Charging the particle.
2. Forcing charged particle to collecting electrodes.
3. Releasing the electrical charge.
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Aerotec high voltage electrodes are subdivided for maximum effectiveness in charging and precipitating functions. Highest precipitating force is developed between flat plates, which provide a uniform field of high intensity.

To reduce the possibility of reentrainment of particles in the gas stream, Aerotec has developed a new "pocket type" collecting electrode. This unique design insures a dead zone surrounding the electrodes for maximum efficiency on both coarse and fine dusts. Release of carbon particles by induced charge, and loss of performance due to "backionization" are reduced to a minimum by this exclusive Aerotec design. Alternate rapping of the collecting electrodes reduces emission and minimizes stack "puffing" during rapping periods.

The Aerotec electrical precipitator is an ideal secondary for the Aerotec Mechanical Design 3 RAS, a combination that assures the highest efficiency possible in dust collection . . . an efficiency that will meet the most stringent dust requirements of today . . . and tomorrow.

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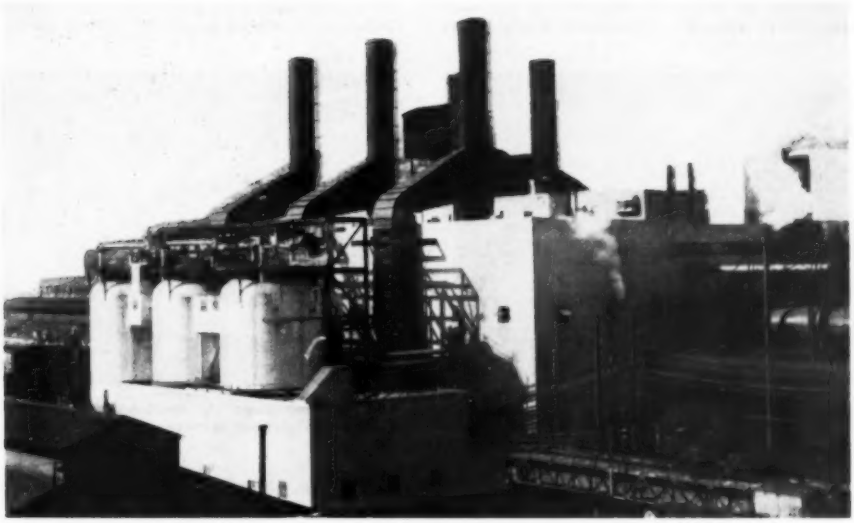
INDUSTRIAL POWER

May, 1951 Vol. 40, No. 5

# NATIONAL TUBE'S NEW BOILER PLANT BETTERS ALLEGHENY'S SMOKE LIMITS



*Softening plant seen near the new boiler house treats raw river water for makeup for the five new boilers*

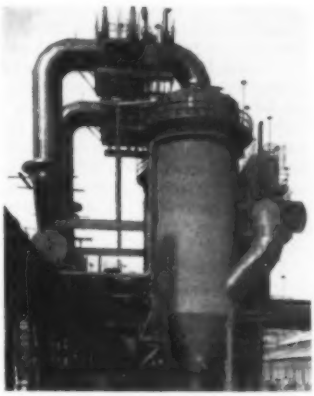
**Vexing problems in fuel gas washing, coal handling, dust and smoke control, and feedwater treatment are met—and efficiently answered—in a modern steel mill powerhouse**

**E. T. MORTSON,** ***Superintendent of Power, National Works, National Tube Company, and*** **WILLIAM J. HARGEST,** ***Editor***

SMOKELESS STACKS on the new boiler plant of National Tube Company's National Works, McKeesport, Pa. are not a sign of slack business but of cooperation of industry with the smoke control program of this busy steel-making center. Designed to produce an absolute minimum of fumes and solids in the waste gases, new boilers are fired with gas from the plant's four blast furnaces, with pulverized coal as an auxiliary fuel.

An average of 17,400,000 cu ft per hr of gas is produced by the furnaces, with approximately 12,000,000 cu ft available for use in the new boiler house as the major fuel supply.

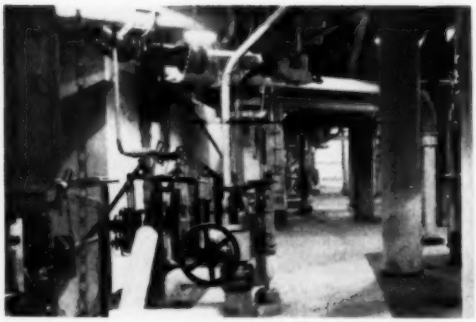
Cleaning, an important factor in smokeless operation, is accomplished in two modern gas washers and two electrostatic precipitators. A main, 9 ft in diameter, conducts the gas from the furnaces to the washers. Based on a gas capacity of 230,000 cfm, dust content is reduced to 0.25 grain per cu ft by multiple fine sprays of water.



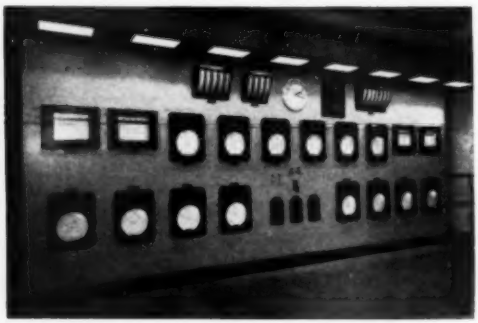
***Primary fuel for the boilers is blast furnace gas, first cleaned in these two washers, then by electrostatic precipitators. Iron ore recovery from the sludge should run 100 tons per day***

*Coal for auxiliary fuel arrives above bunkers by conveyer. Unit, rear, rolls on side rails, unloads coal where needed*

*This is the main aisle of the powerhouse which has five boilers, each with an output of 175,000 lb per hr firing gas*



*Rear view of three of the boilers is shown above. Boilers are of the two-drum type with fully water-cooled furnaces*



*Main control board is supplemented by other panels, seen in top picture, for individual control of each boiler*

From the washers the gas passes to two double-compartment precipitators. Here solids are precipitated by electrostatic charges, reducing the dust content to 0.01 grain per cu ft.

Dust collected in the precipitators is washed away constantly and flows by gravity to a 90 ft diameter multiple-trough thickener, which also receives sludge effluent from the wet washers. Settled solids are pumped directly to a drum-type vacuum filter which can produce 172 ton of filter cake in 24 hr. With a moisture content of 25 per cent, cake is scraped from the drum, dropped directly into cars and removed to the ore stockpile for recovery by sintering.

In a conventional manner, coal is first lifted from barges by a bucket hoist, passed through a crusher to a storage hopper, and fed by seven rotary vane feeders, with a capacity of 150 ton per hr, to a belt conveyer for delivery into a bucket elevator. From here, coal discharges to another belt conveyer mounted over the boiler house coal bunkers and equipped with a tripper. Tramp iron is removed by two magnetic pulleys on the conveyers.

From the boiler house bunkers, the coal passes down through spouts to automatic scales, thence to the feeders and on to the pulverizers. Each boiler has its own scale, feeder, and pulverizer.

Gases and flyash emanating from coal are controlled by dust collectors designed to meet requirements of the new Allegheny County (Pittsburgh and environs) smoke control ordinance. The ash-handling system is the conventional vacuum type with a capacity of 20 ton per hr. It collects from ash, boiler soot, dust collection, and stack hoppers and delivers into a 100 ton capacity silo through a cyclone and air washer. Ashes from the silo are discharged into either trucks or cars by a dustless unloader.

## Boiler Installation

There are five (with space for six) two-drum boilers with fully water-cooled furnaces in the new powerhouse. When burning gas, the steam output of each boiler will be 175,000 lb per hr. With output from coal limited by use of a single pulverizer for each boiler, capacity will be reduced thereby to 125,000 lb of steam per hr.

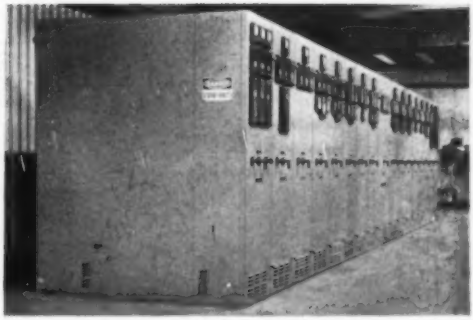
Each boiler has a 60 in. diameter upper drum and a 42 in. diameter lower drum providing a heating surface of 13,800 sq ft. Water-cooled furnace tubes add an additional 4,407 sq ft. Furnace volume is 14,300 cu ft.

Because of availability and past satisfactory performance, tangentially fired units were selected. Boilers are equipped with two-section tubular-type air preheaters with a total heating surface of 16,500 sq ft. Overall full load efficiency is 75 per cent with blast furnace gas and 84 per cent with coal.

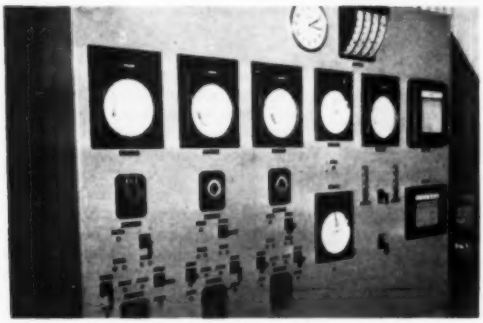
Coke oven gas pilot-burners installed in each unit are capable of producing about 20,000 lb per hr of steam at full valve opening. Superheat temperature from each boiler is controlled by an automatically operated, atomizing spray-type desuperheater in the steam discharge outlet of each boiler. There are no surface condensers available to provide pure water for this purpose, so condensate from the high and low pressure heaters is used.

To minimize maintenance and operational problems, all driven units possible are located on the ground

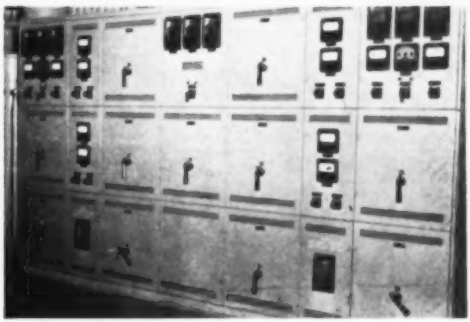
*Water treating plant is the lime-soda, hot process type. Above are filter valves and some of the piping involved*



*Most high power auxiliaries are turbine driven with electrical standby units. This is the main 2300 v panel board*



*Control of water treating plant is from main panel. Two of the tanks are used for softeners, the third as storage*



*Main 440 v substation in the central boiler house provides low voltage power for the smaller motors and for lighting*

floor. All feedwater heaters and pumps are concentrated in one bay at the east end of the boiler house.

Most auxiliary units having high power requirements are steam turbine driven with electrically driven standby units for flexibility of operation and protection against failure. Pressures for driving the auxiliary turbines were determined from heat balance studies.

Pulverizer drives are an exception, for it was felt that steam requirements from coal are so low (approximately 10 per cent of the total) that only a drastic failure of all five units could affect plant operations. As a result, all pulverizers, feeders and scales are motor driven.

With exception of the coal handling system from coal tower to pulverizers, all units are broken up into duplicate sizes and are so cross-connected that only a major failure can seriously affect plant production. Pumps are also installed in duplicate sizes of partial plant capacity, with an extra unit as emergency standby.

Clean water for the boilers presented a problem as no condensate return can be anticipated in the immediate future, leaving raw water from the Monongahela River as the only available source. It was decided to use seven existing settling basins and to hasten the process with coagulants.

## Softening Plant

The new water softening plant is conventional except for size as related to steam output. Because of the varying qualities of the makeup water and consequent varying blowdown from the boilers, it was necessary to design the water-softening plant larger than is customary.

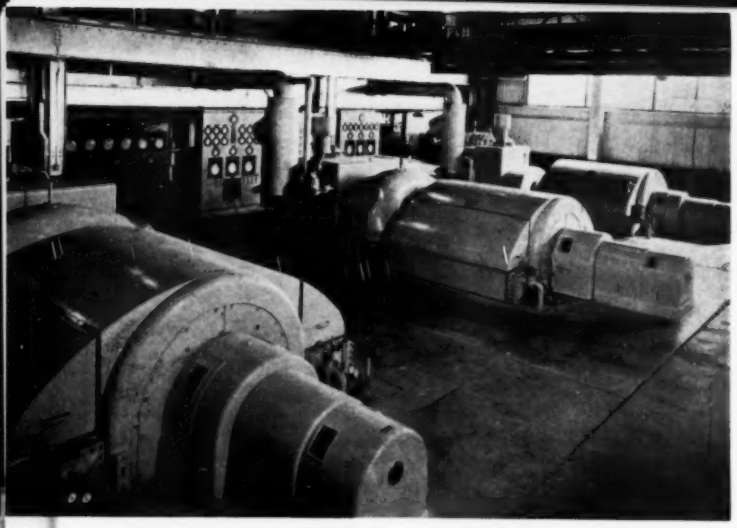
The treating plant is the lime-soda, hot-process type, effecting silica and hardness reduction in reaction tanks, followed by filtering and stabilization before delivery to deaerating equipment.

There are three softening tanks operating at 25 psi and with a maximum capacity of 1,875,000 lb per hr based on a 90 min retention time. Normally, two will be used as softeners and the third as a softened water storage tank.

Fourteen pressure type filters are installed immediately west of the water softening building. Three lime-soda mixing tanks and pumps, two sulphite mixing tanks and pumps, two phosphate mixing tanks and pumps, and one acid tank and pumps constitute the auxiliaries. Each boiler is furnished with its own phosphate feed pump, arranged for timed phosphate feed and automatic flushing of the lines.

All chemicals, handled from cars by means of skids and a storage-battery lift truck, go up an elevator and down a ramp to the second floor of the water-softening plant. Bags of chemicals are opened on the second floor and contents poured through a pipe to the proper mixing tanks. A separate ventilating system for the tanks discharges into a small cyclone collector from which waste materials can be recovered for subsequent disposal.

Indicating and recording instruments and control stations throughout the plant keep the staff thoroughly informed and in control of operating conditions at all times. Up-to-date safety factors and building services make the new smokeless, high-pressure boiler plant a safe and comfortable place for the operators and the engineers to work.



# VARIETY FROM

J. R. ELIASON
G. E. PLAISTED
*General Electric Company*

***Fig. 1—Three 5000 kw turbogenerators supply electrical power for the mill. Process steam comes from two turbines at 45 psig, from all three at 25 psig***

A NEW PAPER MILL for the manufacture of kraft and corrugating materials has recently been put into operation at Antioch, Calif., by Fibreboard Products, Inc. As a manufacturing plant, it is notable in that forest products which had previously been burned or wasted are now converted into pulp and paper.

As an industrial plant, it is more of interest for its steam and electric power systems and their applications. The two main boilers can be fired by either fuel oil or natural gas, and will each generate 160,000 lb per hr of steam at 600 psig and 750 F. Another boiler, a recovery unit, has a capacity of over 100,000 lb per hr of steam burning concentrated black liquor available as a by-product of the pulp making process.

## Steam Applications

Electrical power requirements called for three turbine generators, Fig. 1, each rated 4000 kw. Steam rating is 575 psig, 725 F. Most process steam is required at a pressure of 25 psig, though some steam is also used at 45 psig. Two of the three machines operate as condensing turbines with automatic extraction openings at 25 and 45 psig. The third turbine is non-condensing and exhausts at 25 psig.

An interesting problem was presented by the large log chipper, Fig. 4. It is capable of converting a 20 ft log, 40 in. in diameter, into a pile of chips —all within about 18 sec. Operation is intermittent and will naturally impose a shock on whatever power system is used to drive the chipper. Driving with an electric motor would have required increased size of generators without completely eliminating voltage dips from sudden changes in chipper loads.

Although the economies of most drive problems favor the electric motor, this chipper seemed to be a special case. The steam supply was found capable of supplying a turbine drive, and there was a need for the steam output from a non-condensing turbine. With these considerations the consult-

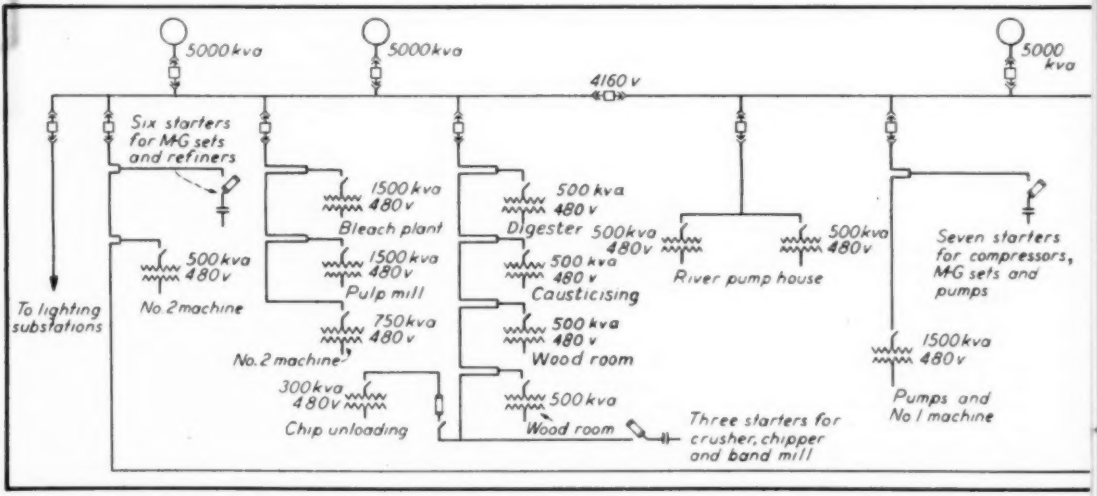



***Fig. 2—Line diagram of the distribution system shows how feeders supply not only the load center substations but also the large 4000 v motors, minimizing voltage fluctuations on the 480 v lines. Normally-open tie breakers***

# INDUSTRIAL POWER SYSTEM

- **Steam supplies turbine driven shock loads and process as well as turbogenerators for electrical power of entire plant**
- **Generation and distribution of 15,000 kw of electrical power in a modern 4160 v system is geared to needs of the plant**
- **Motors with 4000 v windings and current limiting fuses for ratings over 150 hp are economical, cause little voltage dip**
- **Variable speed motors with synchronized speed control allow sectionalized machines for flexibility, simplicity, accuracy**

ing engineer, L. S. Rosener of San Francisco, found the turbine drive provided the most economical and satisfactory answer. The 2500 hp turbine takes its power directly from the boilers and exhausts at 25 psig.

This application of the turbine has been entirely successful. As a log hits the chipper, the steam system remains stable; and before the log is half way through the chipper, the turbine is recovering its initial drop in speed. No torsional vibrations have been observed.

### Electrical System

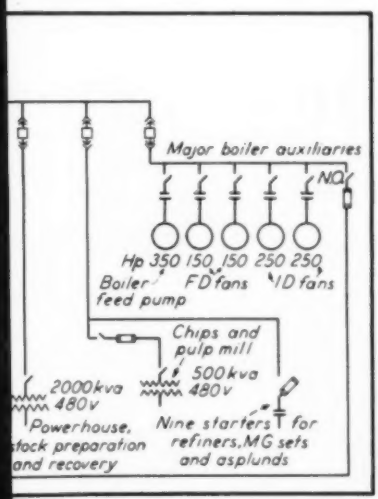
Arrangement of the electric power system is shown in Fig. 2. In line with modern practices for medium sized industrial plants, power is generated and distributed at 4160 v. One of the most important reasons for choice of this voltage is the metal-clad switchgear that receives power from the generators and distributes it to the feeders.

Metal-clad switchgear being a vital link in the system and an appreciable part of its cost, it must be used efficiently. Manufacturers have standardized on a class of switchgear with a design voltage of 4160. A lower voltage system, of course, can not be used to full capacity.

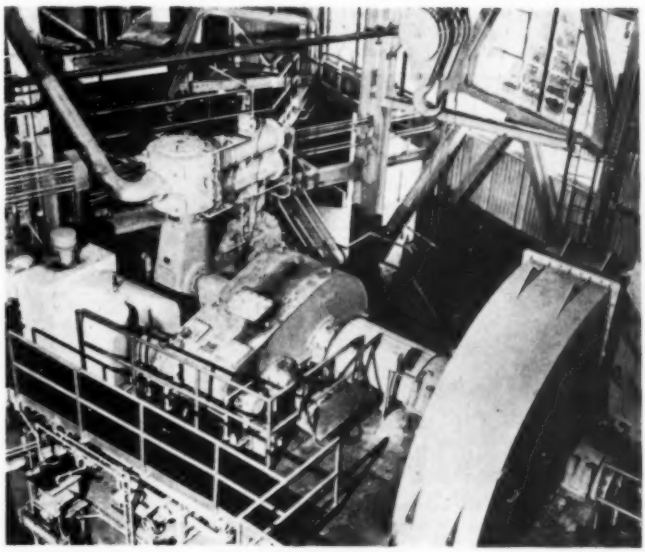
Switchgear installed at Fibreboard has an interrupting rating of 250,000 kva. At 2400 v, this same equipment could be rated at only 150,000 kva. 13,800 v, widely used in larger plants, requires more insulation and more expensive equipment.

**Fig. 3—This 500 kva substation is typical of many. Often, the transformers are outside with short bus-runs to nearby indoor switchgear**

**Fig. 4, below — The chipper, right, is driven by the steam turbine, left, to eliminate shock on electrical system. Reduction gear drive is in center. Above is an air compressor**




**between substations form a secondary selective system to insure continuity**



As shown in Fig. 2, the 4160 v system feeds two types of loads—4000 v motors, and step-down substations. As a general pattern, all motors 150 hp and over are rated 4000 v. Smaller motors are rated 440 v. Economic studies have shown that this pattern (the dividing line may vary from 150 to 250 hp) results in the least expensive system. In addition, the motor starting inrush from a "stiffer" system than a 480 v substation can provide, results in less voltage drop on the feeder and less intereference to other loads.

The 4000 v motor starters incorporate current-limiting fuses for exceptionally fast short-circuit protection of branch circuits and motors. Metal-enclosed and factory assembled, a group of starters is shown in Fig. 6.

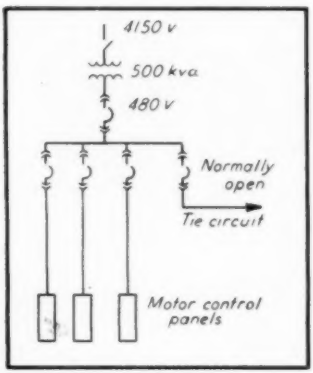



***Fig. 5—Groups of motor control panels are supplied by each breaker. Tie circuit gives emergency source of power***

Load center unit substations are of several sizes, depending on characteristics of the individual load areas. Where possible, identical ratings were installed to obtain advantages of uniformity. One of the eight 500 kva substations is shown in Fig. 3. Note that switchgear is built for indoor use, while the transformers were given a finish making them suitable for outdoor installation. With this combination, transformers can be located outside with a short run of bus duct taking 480 v power through a wall to the switchgear.

## Substation Arrangements

In the interests of simplicity, Fig. 2 does not show details of the 480 v substation secondary circuits, but a typical arrangement is shown in Fig. 5. Breakers are the drawout type. Each feeder supplies a panel of grouped 440 v motor controls. The tie breaker is normally open, but when the intended source is lost, it can connect the 480 v bus with that of another substation. This pairing of substations with a normally open secondary tie (the secondary selective system) provides an emergency source of power to each bus. Transfer switching is done safely with circuit breakers.

In two cases, substations are supplied from fused switches connected with the 4000 v motor starters. These fuses protect both the reduced capacity cable and the transformers. NEC stipulates that the primary overcurrent protection of a transformer shall be set no higher than six times transformer rating, even though the 250 per cent overload protection is provided by a secondary breaker. Thus, in most cases, individual fusing is not a requirement.

Plant lighting is taken from the 4160 v feeder marked for this service in Fig. 2. At centers of lighting load, substations transform power to 208/120 v wye for lighting circuits. The substations are small, ranging in size from 112 1/2 to 300 kva.

Paper machines are sectionalized to provide the flexibility of installation, accuracy of control and mechanical simplicity required in modern high speed operation. That means that each machine is actually several units, driven by motors whose speed and torque must be coordinated by the control system. Each section motor is supplied by its own d-c generator, Fig. 6, and speed of the section is regulated by control of generator voltage.

Section motors and their reduction gears are shown in Fig. 7. Speed control is accomplished by comparing output voltage of a d-c tachometer generator (mounted on the drive motor) with a pre-set reference voltage. Any difference is amplified first electronically and then by an amplidyne to correct the generator excitation. The resulting adjustment of generator voltage brings motor speed to the desired level. Once the reference is set, the regulating system holds the speed accurately. When the reference is changed, calling for a different speed, response is quick and accurate.

Adjustable speed drives, obtaining speed control through control of generator voltage, are used in many other ways in this mill. From generation to utilization, the power system uses modern methods and equipment to add to the overall picture of efficient operation at high levels of production.

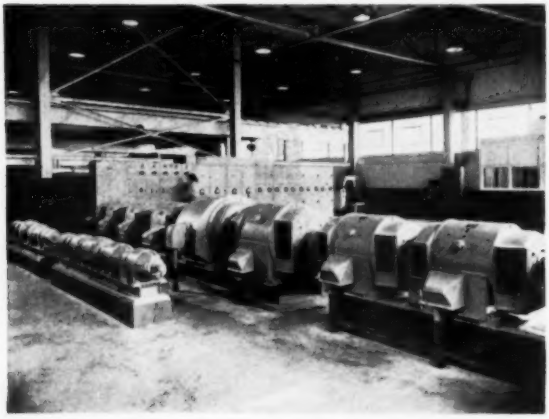


***Fig. 6—M-g sets for the variable speed drive are powered by 4000 v motors. Their starters, shown in background, have current limiting fuses for fast short-circuit protection***

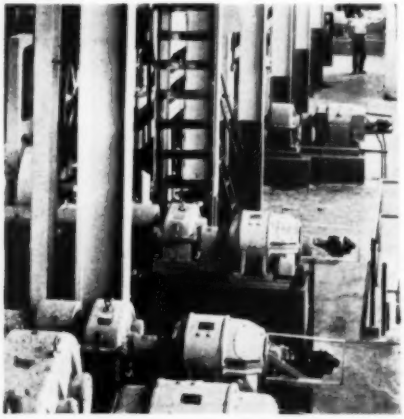


***Fig. 7—Speed control of section motors, above, uses output of d-c generator mounted on shaft and compares it to pre-set reference voltage. Control is accurate, flexible***

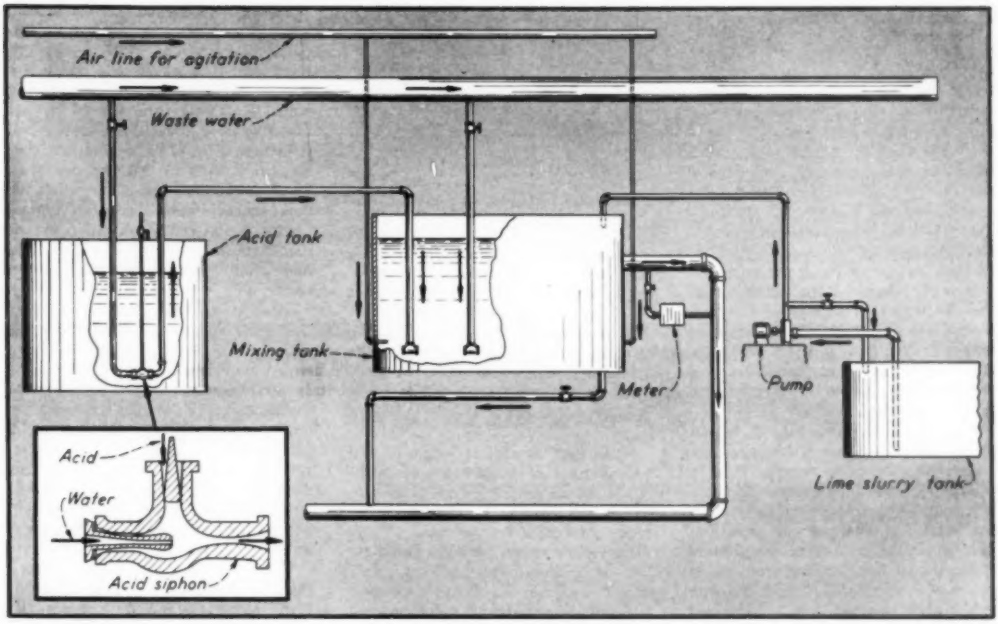



*Fig. 1—Flow diagram of the disposal system shows how spent acid is diluted with waste water in mixing tank, neutralized with lime slurry and discharged*

# OLDS NEUTRALIZES ACID EFFLUENT

**Spent pickling acid is neutralized with lime slurry to eliminate settling lagoons and reduce the dilution necessary. Costs are cut**

**B. H. ROBBINS, *Chemical Laboratory Supervisor, Oldsmobile Forge Plant***

DISPOSAL of spent pickling acid in the Oldsmobile Division, General Motors Corporation forge plant at Lansing formerly employed conventional methods using lime slurry and waste acetylene sludge to neutralize the acid. The resulting mixture of calcium sulphate and iron hydroxide was pumped into lagoons to effect water loss by evaporation and ground seepage. Partly dried solids were dredged out and hauled to a dump at considerable expense.

With the old method, the plant was given a No. 1 classification by the State Water Resources Commission. However, the management had long hoped to eliminate the lagoons, either by shot blasting of forgings or by an acid disposal method not needing lagoons. The latter system was sought and found. It not only dispenses with lagoons but eliminates the use of hydrated lime, cutting disposal costs some 30 per cent.

In the new method, developed by the plant's own laboratory, waste water from the plant, formerly emptied into the county drain, is pumped into a 2000 gal mixing tank. Spent acid is added to the water by a controlled siphon, which maintains a water to spent acid ratio of about 60 to 1 without increasing suspended solids in the solution above the maximum limits of 500 ppm permitted by local regulations.

**TABLE 1—ANALYSIS OF PLANT WATER**

| Impurity | ppm |
|---|---|
| Ca | 112.4 |
| Mg | 33.5 |
| Na | 29.9 |
| Total metallic ions | 175.8 |
| $HCO_3$ | 390.8 |
| Cl | 36.8 |
| $SO_4$ | 106.5 |
| Total non-metallic ions | 534.1 |
| Solids by evaporation | 524.6 |
| $CO_2$ | 47.3 |
| Hardness ($CaCO_3$) | 418.3 |
| pH is 7.2 | |

However, the pH value must be held at not less than 5.5. This is done by adding a small quantity of waste acetylene sludge obtained at no cost from a nearby Fisher Body plant. The effluent meets the approval of local authorities and the five-day biochemical oxygen demand (BOD) remains below the 125 ppm required.

Success of the method depends in part upon the natural bicarbonates that are present to the extent of about 400 ppm in water pumped from wells on plant property. Analysis of the wa-

ter is given in Table 1.

Initially it was planned to use dilution only, but this required a water to spent acid ratio of 350 to 1. Experiments showed that, if the pH were raised by addition of acetylene sludge, the present ratio of less than 60 parts of waste water to one of spent acid would meet requirements and make it unnecessary to pump the added water needed with the higher ratio. This has the further advantage that less effluent enters the sewer, and the sewage bill is reduced because of the lower volume.

A pump, designed for slurries of an abrasive nature, was installed to transfer acetylene sludge into the mixing tank, Fig. 2. Piping for this pump includes a bypass that permits control of flow at any rate up to its maximum capacity of 6 gpm.

The flow diagram, Fig. 1, shows the system as it is now used. All waste water from the plant (except sanitary drainage) flows into a sump having a pump of 600 gpm capacity. From here, the water is discharged into the 2000-gal mixing, or neutralizing, tank through two lines leading from an 8-in. waste water main. The Duriron acid siphon, inset of Fig. 1, is located in one line in the acid tank. The second is for water only. The water valve on the acid line remains fully open, but flow from the second line is regulated to control total flow to the sewer. An air line is connected to produce agitation in the mixing tank.

Manual controls are set so that spent pickle liquor is siphoned into the neutralizing tank to form a solution having a pH value of 3.0. The slurry pump delivery is then so regulated that the pH of the mixing tank effluent is raised to a value between 5.5 and 6.0. Close control of the effluent pH is effected by an instrument, Fig. 3, equipped with a continuous recorder which shows the pH of effluent as it leaves the treatment tank. Checks show that the value at the point where the effluent enters the main city sewer is 0.2 higher than at the point where it leaves the neutralizing tank.

**TABLE 2—ANALYSIS OF EFFLUENT**

| | |
|---|---|
| Total flow | 385 gpm |
| Acid flow | 7 gpm |
| Water-to-acid ratio | 55 to 1 |
| Acid in spent liquor, by volume | 2.2% |
| pH of water acid solution | 3.2 |
| pH after addition of slurry | 5.6 |
| pH of solution in sewer | 5.8 |
| Suspended solids at tank | 224 ppm |
| Suspended solids in sewer | 226 ppm |

A representative check of effluent is given in Table 2.

With acid flow set at 7 gpm or 420 gph, a total of 10,080 gal of spent liquor can be discharged in 24 hr provided acid content of the liquor remains constant at 2.2 per cent.

Before the new system was installed, cost of disposal for one year was: lime (198.6 ton at $22.60 per ton) —$4,488.36; dredging of lagoons and haulage to dump—$4,592.00; direct labor of solution attendant—$3,512.00; for a total of $12,592.36.

With the new method, purchasing of lime is eliminated as is also the cost of dredging the lagoons and haulage to dump. A full-time attendant is no longer required as the system is nearly automatic. Such adjustments as needed are made by plumbers who, for other reasons, make periodic rounds of the plant on all three shifts. The laboratory keeps the pH electrodes in proper condition.

In the present pickling schedule, 5700 gal of spent acid must be disposed of each day. With a water to spent acid ratio of 75 to 1, there is a flow of 297 gpm from the neutralizing tank. With this flow for 24 hr per day, five days a week, the sewage bill is increased by $733.00 a month over the prior bill, or $8,796 per year, which is the total cost of operating the new system. This makes an annual saving of $3,796.36 or $316.36 per month, meaning a reduction of slightly more than 30 per cent in total disposal costs.

This saving required a practically negligible increase in investment, as tanks employed are those used before with the old system. The chief item of new equipment is the recording pH meter. Spent acid from the pickling tanks flows by gravity into an 18,000 gal concrete wall tank lined with acid-resisting brick and located below the floor of the building that houses the treatment tank, Fig. 2. This equipment, however, was a part of the old disposal setup.

Besides savings in disposal costs, there is the substantial advantage of being rid of the unsightly settling lagoons. These occupied considerable space which, though not required at present, can be used otherwise if needed.

Although a similar system doubtless can be employed at many other plants having spent-acid disposal problems, it should be noted that the method depends largely upon a sizable supply of water (available in this case from waste sources) for dilution. Variations to adapt a similar system to different local conditions may well be possible in some cases.

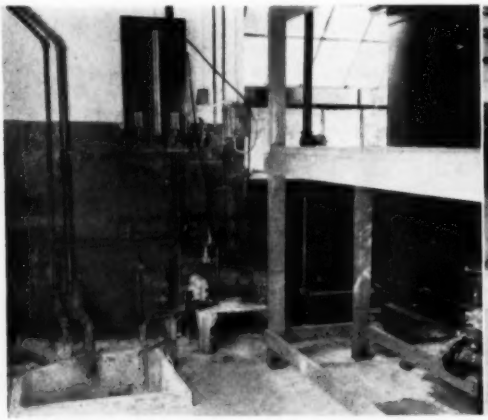


*Fig. 2—Access to the lime slurry tank is in the floor at left while the 2000-gal mixing tank shows at extreme right. Bypass on slurry pump allows control of flow rate to tank*

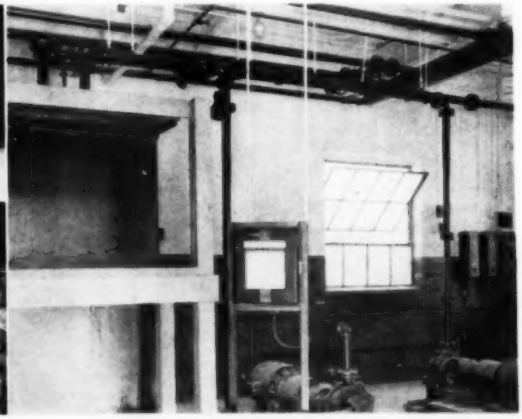
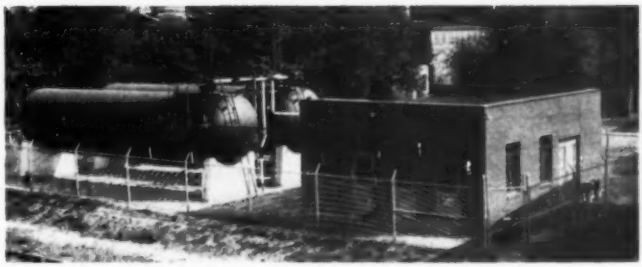


*Fig. 3—Continuous record of this instrument shows the pH value as it leaves the tank, allowing close control. Check value on effluent at city main is 0.2 higher than at tank*

*Typical self-contained LP Gas plant complete with storage tanks and building for mixing and control equipment*



**PAUL E. PEACOCK, JR.**
*LP Gas Plant Engineer*
*And Design Consultant*

# LP GAS IS THE ANSWER TO STANDBY FUEL PROBLEMS AT INDUSTRIAL PLANTS

**Here are the fundamental factors involved in plant design and operation; also, recommendations for selection of equipment to meet specific industrial needs when using LP Gas as standby fuel**

LIQUEFIED PETROLEUM gas, commonly referred to as LP Gas, serves industry in hundreds of ways. In many industrial applications, it is the sole fuel supply for normal operations. However, in a far greater number of industrial applications LP Gas serves as a standby fuel to manufactured and natural gas.

Because LP Gas can be condensed to a liquid state at moderate pressures, it offers many advantages to the industrial consumer requiring a standby gas supply. LP Gas is shipped in liquid form, stored as a liquid, and kept on hand in this concentrated form ready for immediate use when and as needed. In a standard LP Gas liquid storage tank of 9 ft outside diameter and 67 ft long, it is possible to store the equivalent (in Btu) of 2,400,000 cu ft of 1000 Btu natural gas.

**TABLE 1 — PHYSICAL PROPERTIES OF LIQUID-PETROLEUM GASES**

| | Propane | Butane | Iso-Butane |
|---|---|---|---|
| Formula | $C_3H_8$ | $C_4H_{10}$ | $C_4H_{10}$ |
| Boiling point, deg F | —44 | 32 | 10 |
| Specific gravity of gas (Air = 1.00) | 1.53 | 2.00 | 2.06 |
| Specific gravity of liquid (Water = 1.00) | 0.51 | 0.58 | 0.57 |
| Latent heat of vaporization at boiling point, Btu per lb | 185 | 165 | 158 |
| Vapor pressure, at following temperatures: | | | |
| Psig at —40 F | 1.5 | ... | ... |
| Psig at —30 F | 5.6 | ... | ... |
| Psig at —20 F | 10.7 | ... | ... |
| Psig at —10 F | 16.7 | ... | ... |
| Psig at 0 F | 23.5 | ... | ... |
| Psig at 10 F | 31.3 | ... | ... |
| Psig at 20 F | 40.8 | ... | 3.5 |
| Psig at 30 F | 51.6 | ... | 7.6 |
| Psig at 40 F | 63.3 | 3.0 | 12.2 |
| Psig at 50 F | 77.1 | 6.9 | 17.8 |
| Psig at 60 F | 92.4 | 11.8 | 24.0 |
| Psig at 70 F | 100.0 | 18.9 | 31.1 |
| Psig at 80 F | 128.0 | 22.9 | 39.2 |
| Psig at 90 F | 149.0 | 29.8 | 48.6 |
| Psig at 100 F | 172.0 | 37.5 | 59.0 |
| Psig at 110 F | 197.0 | 46.1 | 70.4 |
| Lb per gal of liquid at 60 F | 4.23 | 4.85 | 4.71 |
| Gal per lb of liquid at 60 F | 0.236 | 0.206 | 0.206 |
| Btu per lb of gas, gross | 21,633 | 21,331 | 21,331 |
| Btu per cu ft of gas at 60 F and 30 in. Hg | 2,520 | 3,275 | 3,275 |
| Btu per gal of gas at 60 F | 91,690 | 103,500 | 103,500 |
| Cu ft of gas per gal of liquid at 60 F and 30 in. Hg | 37.0 | 31.6 | 30.2 |
| Cu ft of gas per lb of liquid at 60 F and 30 in. Hg | 8.58 | 6.57 | 6.51 |
| Cu ft of air required to burn 1 cu ft of gas | 24 | 31 | 31 |
| Lower limit of inflammability, per cent of gas | 2.3 | 1.9 | 1.9 |
| Upper limit of inflammability, per cent of gas | 9.5 | 8.4 | 8.4 |
| Maximum rate of flame propagation in 1 in. tube, ft per sec | 2.69 | 2.71 | 2.71 |
| Flame temperature, deg F | 3,710 | 3,735 | 3,735 |
| Octane number (Iso-Octane = 100) | 125 | 91 | 99 |

**TABLE 2 — KNOY "C" FACTORS FOR PROPANE-AIR MIXTURES**

| Btu of Gas | Specific Gravity | Sp. Gr. | Knoy "C" Factor |
|---|---|---|---|
| 1,000 | 1.21029 | 1.10013 | 749.91 |
| 1,025 | 1.21557 | 1.10253 | 770.95 |
| 1,050 | 1.22083 | 1.10491 | 791.92 |
| 1,075 | 1.22609 | 1.10729 | 812.79 |
| 1,100 | 1.23135 | 1.10966 | 833.59 |
| 1,125 | 1.23661 | 1.11203 | 854.29 |
| 1,150 | 1.24187 | 1.11439 | 874.92 |
| 1,175 | 1.24712 | 1.11674 | 895.46 |
| 1,200 | 1.25238 | 1.11909 | 915.91 |
| 1,225 | 1.25764 | 1.12145 | 936.28 |
| 1,250 | 1.26290 | 1.12379 | 955.69 |
| 1,275 | 1.26815 | 1.12612 | 976.90 |
| 1,300 | 1.27341 | 1.12846 | 996.93 |
| 1,325 | 1.27867 | 1.13078 | 1,016.99 |
| 1,350 | 1.28393 | 1.13309 | 1,036.99 |
| 1,375 | 1.28918 | 1.13542 | 1,056.88 |
| 1,380 | 1.29023 | 1.13588 | 1,060.85 |
| 1,385 | 1.29129 | 1.13635 | 1,064.81 |
| 1,390 | 1.29234 | 1.13681 | 1,068.78 |
| 1,395 | 1.29339 | 1.13727 | 1,072.74 |
| 1,400 | 1.29444 | 1.13773 | 1,076.70 |
| 1,405 | 1.29550 | 1.13820 | 1,080.66 |
| 1,410 | 1.29655 | 1.13866 | 1,084.61 |
| 1,415 | 1.29760 | 1.13912 | 1,088.56 |
| 1,420 | 1.29865 | 1.13958 | 1,092.51 |
| 1,425 | 1.29970 | 1.14004 | 1,096.45 |
| 1,430 | 1.30075 | 1.14050 | 1,100.39 |
| 1,435 | 1.30180 | 1.14096 | 1,104.33 |
| 1,440 | 1.30286 | 1.14143 | 1,108.26 |
| 1,445 | 1.30391 | 1.14189 | 1,112.19 |
| 1,450 | 1.30496 | 1.14235 | 1,116.12 |
| 1,455 | 1.30601 | 1.14281 | 1,120.05 |
| 1,460 | 1.30706 | 1.14327 | 1,123.97 |
| 1,465 | 1.30811 | 1.14373 | 1,127.89 |
| 1,470 | 1.30916 | 1.14419 | 1,131.81 |
| 1,475 | 1.31021 | 1.14464 | 1,135.72 |
| 1,480 | 1.31127 | 1.14511 | 1,139.63 |
| 1,485 | 1.31232 | 1.14557 | 1,143.54 |
| 1,490 | 1.31337 | 1.14602 | 1,147.45 |
| 1,495 | 1.31442 | 1.14648 | 1,151.35 |
| 1,500 | 1.31547 | 1.14694 | 1,155.25 |

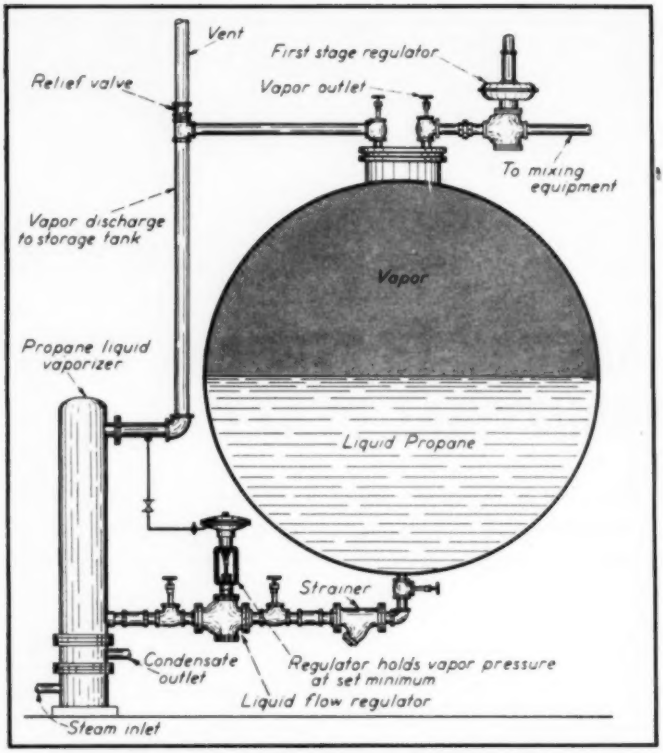



**Fig. 1—Use of artificial vaporizer is recommended. Vapor is fed back to tank where it is held by single control to predetermined minimum pressure**

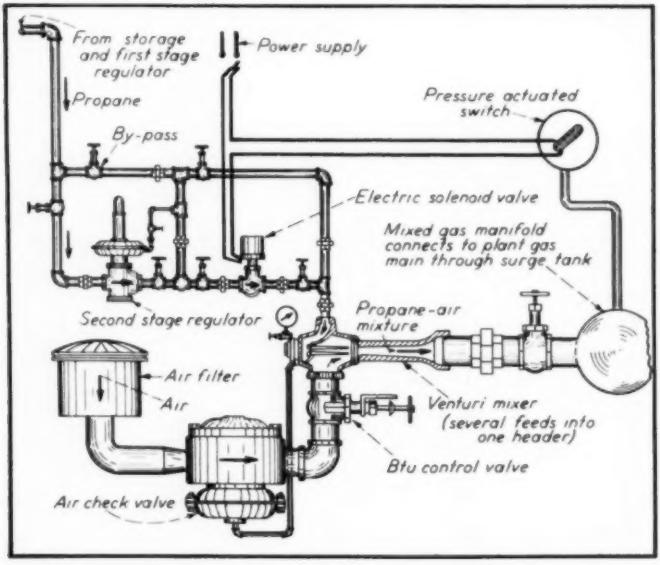



**Fig. 2—Venturi mixers for propane-air gases are suitable for gas-main pressures to 4 psig. Two or more mixers are installed to meet load demands**

LP Gas is of two generally used types, butane and propane. Although butane was the accepted LP Gas 15 or 20 years ago, the increasing supply of propane and its more favorable characteristics has caused a swing almost completely to propane in recent years. By a study of the physical properties of the two gases as listed in Table 1, the industrial engineer will readily see the many advantages of propane.

### Used With Standard Burners

Many industries use the propane vapor in its natural or undiluted form. Where propane is used as a standby fuel for manufactured or natural gas, it is seldom advisable to use the propane in the undiluted form due to its high Btu content. Propane vapor has a heating value of 2520 Btu as compared to 500-550 Btu for manufactured gas and 900-1000 Btu for natural gas. Because of this high heating value it is not possible to use propane as a substitute fuel without complete readjustment of gas burners or equipment. In some industrial applications where only a few items of equipment are involved it is possible to utilize the propane vapor as a substitute fuel by a change of the gas orifice. In other applications where a premix is used it may be possible to use the propane vapor by a readjustment of the carburetor of the premix unit. But when multiple gas equipment is used, as in most industrial applications, it is often too great a task to change orifices or equipment back and forth from the lower Btu of normal gas to the higher Btu of propane. In such applications the propane vapor is diluted with air and used as propane-air gas.

In using propane-air gas as a standby fuel, it is possible to produce a gas that can be mixed in with the present gas in varying quantities as needed or used as a 100 per cent replacement of the normal gas supply. This complete interchangeability of propane-air gas with the normal gas supply makes propane-air the ideal substitute fuel for standby purposes. With a properly designed propane-air plant, it is usually possible to change utilization equipment back and forth from the base gas supply to propane-air gas with little or no change in burner performance or flame characteristic.

### Propane-Air Mix Ratios

Several formulas have been developed for determining the proper Btu of the replacement gas. One of the most widely used is a formula developed several years ago and known as the Knoy Formula. The Knoy Formula is based upon a relationship between the specific gravity and the Btu of the

gas and a theoretical burner head Btu value of all gases after primary air injection. The theory is that the burner head mixture of the gas after primary air injection will be close to 175 Btu per cu ft for all gases.

According to the Knoy Formula, satisfactory operation will be maintained with an interchange of any two gases having the same relationship or balance as expressed in a factor *C*. Any two gases having approximately the same *C* factor will be interchangeable with most equipment made up to and including 100 per cent replacement. The Knoy Formula is as follows:

$$\frac{\text{Btu} - 175}{\sqrt{\text{Sp. Gr.}}} = \text{C}$$

Btu = Btu of gas being applied for the C factor

175 = theoretical Btu of burner head mixture

Sp. Gr. = specific gravity of gas being applied

C = constant for comparison between gases

The Knoy Formula is based upon burner performance rather than actual orifice flow factors. When orifice flow formulas are used to determine the Btu capacity of a given orifice under different conditions, it will be found that the gas Btu indicated by the Knoy Formula would result in a theoretical reduction of approximately 5 per cent in Btu capacity through the orifice. Since most manufactured and natural gases contain inerts in varying percentages, and propane is generally free of such inerts, the absence of inerts in the propane will completely or substantially eliminate the theoretical loss in Btu capacity indicated by orifice flow formulas.

To assist the industrial engineer in working out a typical problem we will assume the firm is supplied with natural gas having a heating value of 1000 Btu per cu ft and a specific gravity of 0.6; by applying the Knoy Formula, we now have the equation:

$$\frac{1000 - 175}{\sqrt{0.6}} = \frac{825}{0.7746} = 1065.06 = \text{C factor for the natural gas}$$

To arrive at the proper propane-air factor, it would be necessary to use the "trial and error" method, which would be quite lengthy. To eliminate this work, Table 2 has been prepared.

Continuing with the problem, it will be observed from Table 2 that the propane-air mixture having a *C* factor nearest to 1065.06 is 1064.81; therefore, the propane-air mixture in this

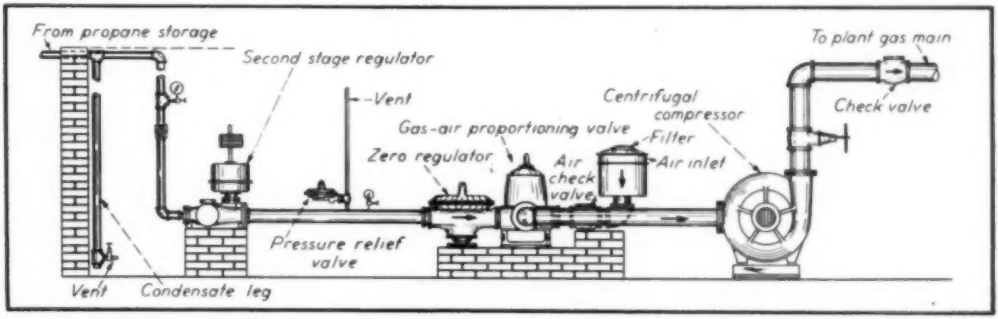



**Fig. 3—Propane-air mixing equipment employing centrifugal compressor, air filter, and industrial carburetor. It is advisable to install two compressors, one for standby, rather than single unit. Handles pressures to 7 psig**

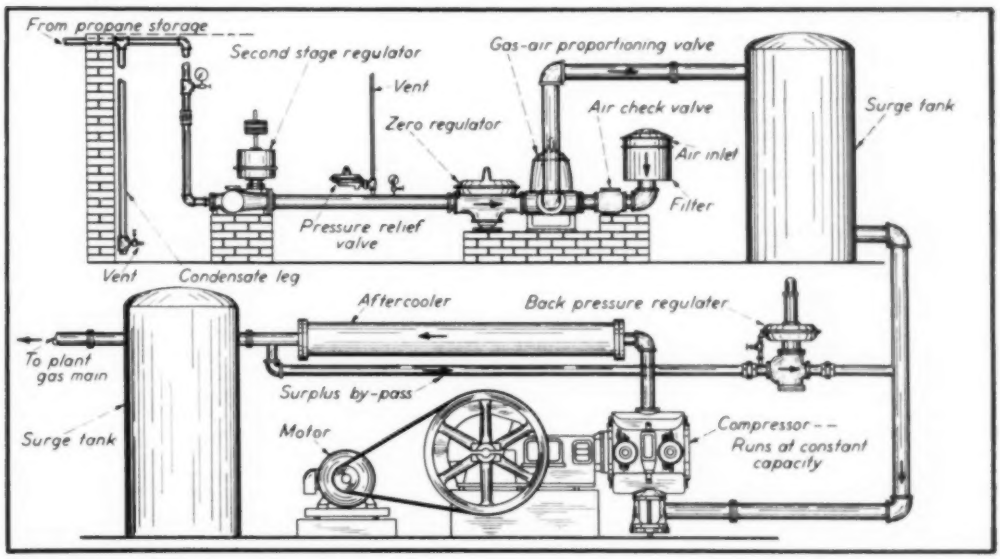
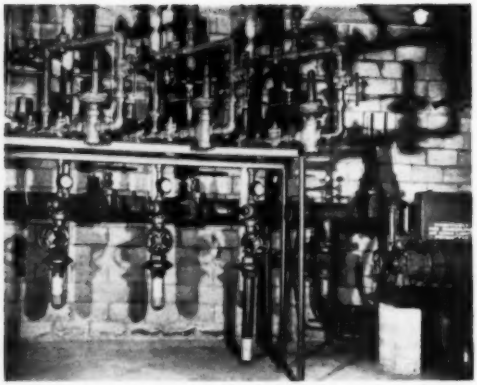



**Fig. 4—Reciprocating compressor is used in mixing hookup for gas-main pressures exceeding 7 psig. Compressor runs at constant capacity with by-pass back to the cylinder and pressure regulator in the by-pass gas line**

*Propane-air mixers using centrifugal compressors. Should power fail, venturi mixers in background start operating*



*Typical installation of venturi mixing equipment. Several venturi units feed one header. Rotary meter measures gas*

problem must have a heat content of 1385 Btu per cu ft. The propane-air gas has a higher Btu content than the gas for which it is being substituted; this is required in order to offset the increased specific gravity of the propane-air gas and to permit interchangeability of propane-air gas and natural gas without any adjustment of the burner equipment.

After determining the proper Btu of the replacement gas it is necessary to plan well the size of propane storage facilities, the type and capacity of propane-air gas mixing equipment best suited for individual requirements, and other important aspects of the general problem.

As mentioned previously, a standard propane liquid storage tank 9 ft in diameter and 67 ft long will hold the equivalent of 2,400,000 cu ft of 1000 Btu natural gas. In planning propane storage facilities it is usually advisable to install a sufficient number of tanks to provide for thirty days of 100 per cent curtailment of the natural gas supply.

## Selecting Storage Tanks

In selecting the number of storage tanks, it is best to lean toward the high side rather than the low side due to the hesitancy of propane liquid suppliers to contract for delivery of propane on an "as wanted" basis. Consideration must be given to the fact that the propane producer cannot provide capacity to supply the propane or tank cars to deliver it as needed during the colder winter weather and then have this equipment operating at 50 per cent or less capacity during much of the rest of the year. It is industry's responsibility to install adequate storage facilities for receiving the propane during normal seasons.

In addition to the satisfaction of knowing that sufficient storage is on hand to meet normal curtailment needs, there is the economic advantage to the industry as well. Since propane is sold on a "posted price" basis, the price fluctuates somewhat with demand. It is not unusual for propane to be 3c per gal cheaper during summer months than during certain winter periods. This is equivalent to a saving of approximately 32c per 1000 cu ft of 1000 Btu gas.

## Use Artificial Vaporizers

After the selection of the storage tank size and number, consideration must be given to the possible need of an artificial vaporizer. As the type of mixing equipment may vary, the need of an artificial vaporizer will vary. While considerable vaporization of the propane liquid will be obtained under normal conditions from atmospheric heat transfer through the surface of the tank to the liquid, it is not generally safe to rely entirely on it. As the propane is used from the tank, the quantity in the tank reduces and the square feet of exposed transfer surface reduces accordingly. A point will shortly be reached where the withdrawal rate is greater than the heat transfer rate and the temperature of the liquid will start reducing due to refrigeration caused by the rate of withdrawal. Eventually the tank pressure will be reduced below the point of use and the entire standby plant will become of little value due to the lack of a vaporizer. With almost every installation there will be a time when an artificial vaporizer will be needed. Because of this fact, and because of the low cost of the artificial vaporizer in relation to the total plant cost, a vaporizer is a good investment.

The generally accepted artificial vaporizer is the steam heated type. In a few of the older butane installations hot water vaporizers were used and in the smaller installations quite often a direct fired, gas heated vaporizer is used. The latter type offers the principal advantage of being completely automatic and requiring no water or steam lines that would freeze if neglected. With all types, the installation arrangement would fall into one of two general types. First is the direct supply type that supplies the vaporized propane directly from the vaporizer to the mixing equipment; it requires a complicated installation arrangement. The second is the "feed back" type, and is generally preferred because it can be operated by a single control to maintain a predetermined minimum pressure in the storage tank; Fig. 1.

## Additional Benefits

With this arrangement the installation and operation is quite simple. Additional benefit lies in the fact that full advantage is taken of the available atmospheric heat for vaporization, and the artificial vaporizer then supplies the quantity not supplied from atmospheric temperatures. Under this plan all vapor from the vaporizer returns to the storage tank and all vapor withdrawn for the mixing equipment comes from the storage tank. In the event the vaporizer should cease operating for any reason, the equipment would continue operating for a reasonable period by drawing upon the vapor stored in the tank and relying entirely upon atmospheric vaporization.

With all types of mixing equipment, the size of the storage facilities and the vaporizer arrangement is generally the same. From this point, however, every industrial plant has certain individual problems and conditions that must be considered in the selection of

the best type of mixing equipment.

In planning an LP Gas installation, the industrial engineer should seek the advice and assistance of those experienced in LP Gas plant design and qualified to give this help.

Generally speaking, the propane-air mixing equipment will fall under one of three types as follows:

### Venturi Mixing Unit

Under this general heading several variations are available. One arrangement is illustrated. In the venturi mixing system, the energy of the propane vapor under pressure is utilized to entrain the necessary air for dilution of the vapor to the desired Btu content. Operation is on an intermittent "on-off" basis controlled by a pressure switch in the mixed gas main. Usually two or more venturi mixers are installed and the mixers operate individually as required to meet the load demand. Variations of pressure in the gas main will cause one or more of the venturi mixers to operate to supply the demand. Arrangement of equipment is shown in Fig. 2.

Since the venturi mixer is dependent upon the energy of the propane for the mixing, the unit is limited to the discharge pressure developed by the pressure of the propane at the venturi nozzle. Due to possible condensation of the propane vapor to the liquid form during severe winter weather it is advisable to use a vapor pressure of not more than 30 psig. With such vapor pressure at the nozzle, the operating pressure obtainable at the discharge of the venturi will be approximately 4 psig when mixing an exchange gas for natural gas.

### Centrifugal Compressor

Many arrangements are available utilizing the centrifugal or rotary compressor as the mixing and boosting unit. The propane vapor is reduced in pressure at a second stage regulator to approximately 6 in. of water and then admitted to an industrial carburetor type of ratio mixing valve arrangement for dilution with air. As a part of the carburetor, a zero governor reduces the propane pressure further to a slight sub-zero pressure so that the propane vapor and air are drawn through the proportioning vanes of the carburetor under a slight vacuum by the suction of the compressor. The compressor is sized for cubic feet per hour maximum demand as well as for discharge pressure desired; the latter is usually limited to 7 psig. Equipment layout is shown in Fig. 3.

Due to the fact the normal curtailment of natural gas supply is less than 100 per cent of total demand, it is advisable to install at least two mixing units to serve the total demand rather than a single large unit. Such an arrangement of two or more mixing units will allow greater flexibility of operation and will provide a spare unit in case of mechanical breakdown of one of the units.

### Reciprocating Compressor

This mixing system is the same as that above with the replacement of the centrifugal compressor with a reciprocating compressor. This arrangement is for discharge pressures above 7 psig. The use of two or more units is advisable for the same reasons as outlined for the centrifugal unit. Due to the performance of the carburetor, it is necessary to operate the compressor at constant capacity rather than an intermittent "on-off" basis as with some air compressors. The surplus mixed gas is recirculated by use of a back-pressure regulator which has been set to hold the desired pressure in the plant gas main. Any surplus compressor capacity is by-passed back to the compressor suction by the back-pressure regulator and recirculated; Fig. 4.

### Other Types

Many types of mixing units are available, but they all fall into the above three general categories; for example, the Gasair unit with combined direct-fired vaporizer and venturi mixing unit, the Askania proportioning unit with automatic Btu control, the Cutler-Hammer venturi mixing unit with automatic Btu control, and the venturi mixing unit electrically operated from storage batteries. The fact that many installations have been made utilizing each type of equipment indicates that the equipment is suitable for given conditions *when properly applied to those conditions.*

Propane is transported to industrial sites in high-pressure tank cars or trucks with capacities up to 12,000 and 8,500 gal., respectively. Transfer of the liquid from these carriers to storage tanks requires the hookup shown in Fig. 5.

*Editor's Note—The author is a nationally recognized authority in the LP Gas engineering and operating field. Since 1930 he has designed more than 50 peak-load and standby plants for gas utilities and industrial firms, including several large installations in foreign countries.*

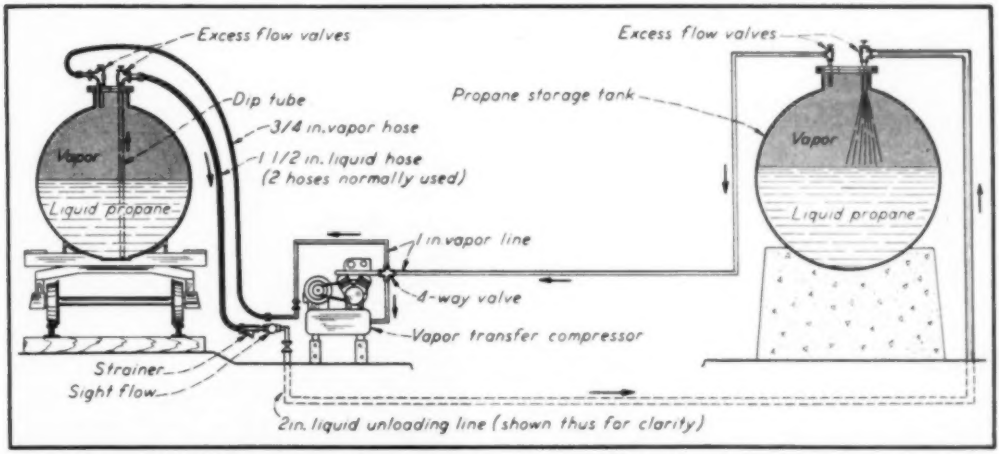
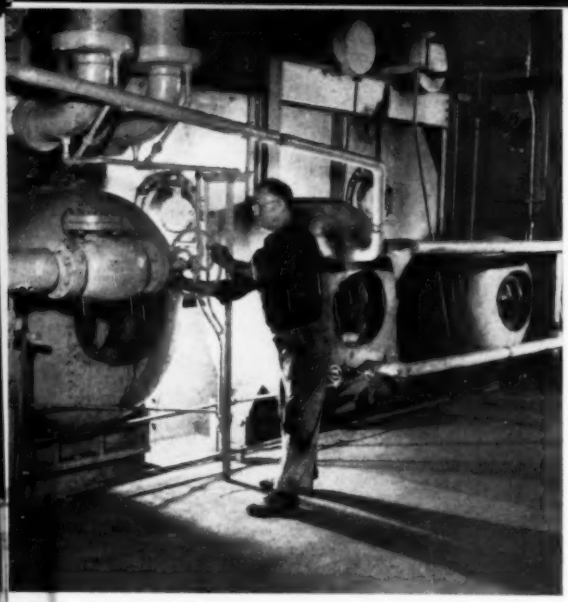



**Fig. 5—Recommended piping arrangement for transfer of liquid propane from tank car or motor truck to plant storage tank is shown here. Operation is safe and fast when a transfer compressor is utilized in the vapor line**



*Steam drum heads are covered with 3 in. of 85 per cent magnesia insulation and finished with asbestos cement. Metal strips around the openings protect insulation from abrasion*

**HARRY W. VANCE,** *Project Manager*
*The Rust Engineering Company*

Here is a "quickie" on how J & L gets central-station efficiency and appearance without excessive cost for industrial steam plants. Most insulation is 85 per cent magnesia, carefully engineered, bound in place by wires and covered with canvas jackets or asbestos cement

# STREAMLINED STEAM PLANT INSULATION

TEMPERATURES and pressures in this industrial unit are not as high as those found in utility central station steam plants. Nevertheless insulation of heated lines and equipment was carefully engineered as is the practice in central station installations to assure efficient and economical generation and distribution of steam. Ambient air temperatures in the steam plant are kept at comfortable levels.

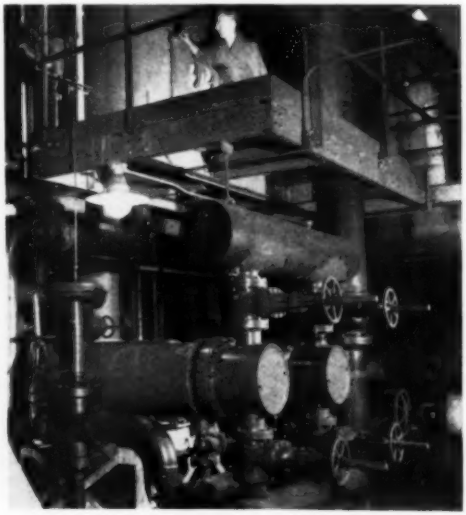
Replacement of 43 older boilers by five new ones, capable of producing well over 1,000,000 lb per hr of steam was recently completed at the Jones & Laughlin Steel Corp. South Side Works at Pittsburgh. The plant has a rated continuous capacity of 875,000 lb per hr of steam at 150 psig, 466 F. Designed and constructed by The Rust Engineering Co., the plant offers a notable example of the advantages of modern steam generating equipment. New boilers increase efficiency greatly, occupy less space and operate with greater economy than units replaced.

Most heated surfaces were insulated with 85 per cent magnesia. On the gas flue, where the temperature exceeds 600 F, the magnesia was applied over a layer of diatomaceous silica-type insulation. This combination utilizes the resistance of diatomaceous silica to effects of high temperatures and the low heat conductivity of the 85 per cent magnesia.

Thicknesses of insulation used are listed in Tables 1 and 2. They were chosen on the basis of the operating temperatures, heat production costs, and factors pertinent to this plant.

Application methods are an interesting and important part of the installation. To obtain a tight fit, surfaces were cleaned of scale and other foreign matter before application. To prevent escape of heat through junctions in blocks, sections and segments, joints were staggered where possible and sealed with insulating cement.

Pipe insulation was secured with black annealed lacing wire, the gage



*Flash tank and heat exchangers have 2 in. insulation finished with asbestos cement. Insulation is beveled enough on both sides of flanges to permit removal of the bolts. Coverings are secured with wires, and attachments are located before the installation when necessary*

varying with pipe size. No. 18 gage was used for pipes under 1½ in. in diameter, No. 16 for piping less than 4 in. and No. 14 for 5 in. and larger. At flanges, the insulation was beveled at both sides of the joint to permit removal of bolts.

Pipe bends, flanges, fittings and valves were covered with pipe insulation sections cut and mitered to fit the surface, and wired in place with as many loops as necessary to obtain a firm installation.

Insulation was finished with a canvas jacket pasted on so that seams and joints were located where least visible. Where a smooth foundation for the canvas could not be obtained, as in the case of insulation on pipe bends and fittings, a ¼ in. thick coat of asbestos cement was applied over the insulation and troweled smooth. The canvas was then pasted on over the cement.

Some insulated lines are located outdoors and exposed to the weather. On these lines, the canvas jacket was omitted and insulation was made weather-resistant by enclosing it in a 35 lb. asphalt-saturated, uncoated asbestos felt jacket, secured in place with No. 14 gage Copperweld wire. All joints in the jacket were lapped at least three inches with laps turned down to shed water.

On equipment less than 5 ft in diameter, insulation was secured in place by means of annealed steel wire loops. For larger equipment, ¾ in. steel strapping was used. Both loops and strapping were spaced at intervals of 1 ft. In some cases, angle irons were tack-welded to the surface of the equipment to serve as an anchor point for the strapping and to give further support to the insulation.

Provision for securing insulation to drum heads was made before equipment was completely installed. Two wire cables were wrapped around the surface of the shell, with hairpin wires looped around the cables at frequent intervals and drawn outward to clear the boiler walls. When insulation was applied, lacing wires were attached to the hairpins. The lacing was then drawn tightly to a cable looped around the manhole opening.

At all manholes, nozzles, heads and other openings, insulation was beveled so that bolts and covers could be removed without disturbing it. To protect the insulation from abrasion at these points, metal strips were installed around the openings.

Equipment insulation was finished with a ½ in. thick layer of asbestos cement applied over a layer of hexagonal wire mesh stretched over the base layer and wired tightly in place. The cement was troweled on in two coats, the second receiving a smooth finish to provide good appearance.

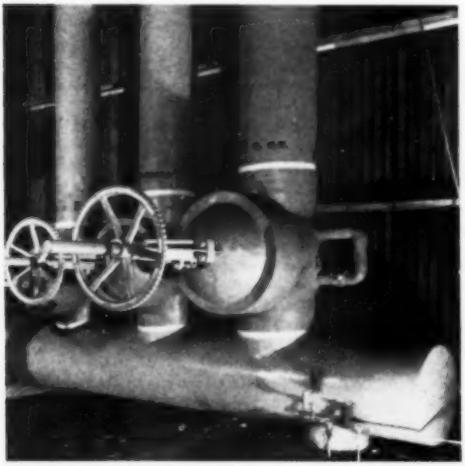
**TABLE 1—PIPE INSULATION—85 PER CENT MAGNESIA**
**THICKNESS IN INCHES BY USE AND PIPE SIZES**

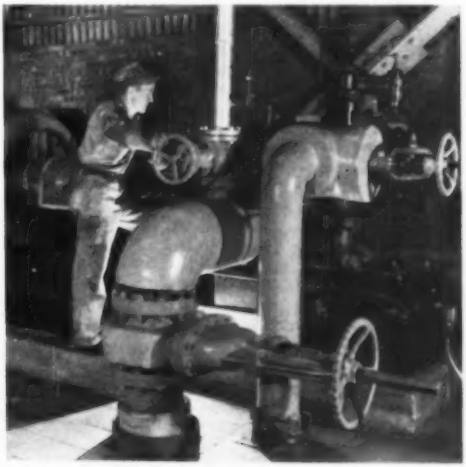
| Pipe diameter, in. | 1½ or less | 2 to 3½ | 4 | 5 to 6 | 8 to 10 | 12 or over |
|---|---|---|---|---|---|---|
| Indoor high-pressure steam and blowdown pipes—500 F | 1-1/2 | 2 | 2 | 2-5/16 | 2-1/2 | 3 |
| Outdoor steam pipes for ash handling equipment—500 F | 2 | 2-5/32 | 2-1/4 | 3 | 3 | 3 |
| Exhaust steam, 5-psig flash steam, boiler feed, treated water, and steam traced lines | 7/8 | 1-1/32 | 1-1/8 | 1-1/8 | 1-1/4 | 1-1/2 |

**TABLE 2—EQUIPMENT INSULATION—85 PER CENT MAGNESIA**

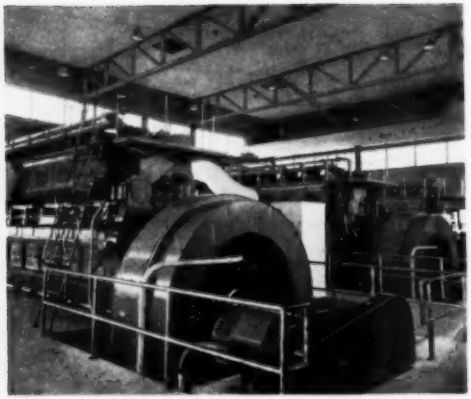
| *Equipment* | *Thickness, in.* |
|---|---|
| Deaerator, flash tank and heat exchanger | 2 |
| Steam drum and mud drum heads, superheater inlet and outlet headers | 3 |
| Exposed nipple areas of superheater outlet tubes | 3 |
| Bridge wall header | 2 |
| Circulator tubes, on rear, front and side walls | 1½ |
| Gas flue to boiler and air heater | 2½* |
| Air heater | 1 |
| Gas flue, air heater to dust collector, duct to fans | 2 |
| Soot hoppers | 3 |
| Ducts to stoker and coke oven gas wind boxes | |

*Applied over 1 in. diatomaceous silica.





***High-pressure piping and valves have 3 in. thick, magnesia-base insulation covered with a pasted canvas jacket. Good appearance as well as efficiency are emphasized. Joints are hidden when possible. Turbogenerator is shown at right***



*These three 3500 hp dual fuel diesel units will eventually drive 2480 kw alternators to take over peak demand loads*

*Switchboard, enclosed in glass room overlooking the engines, contains all necessary equipment for automatic operation*

# STANDBY DIESELS TAKE POWER LOAD

**Three dual fuel diesel units, planned as standby equipment to generate electrical power, are now on line waiting completion of the main steam generating plant. Diesels will later carry only the peak loads**

NORTHEAST MISSOURI Electric Power Cooperative, one of the nation's newest and largest rural power co-ops, has put into service a 10,500-hp diesel plant. This plant is the first generating unit in a great system that ultimately will serve 55,000 farm homes in 27 counties of northeast Missouri and south central Iowa.

Designated as the South River Station, it is a dual power unit consisting of the diesel plant and a 15,000 kw high pressure steam turbine plant. When completed, steam will carry the base load with the diesels taking peaks and providing standby protection. Actually the diesels may be destined for 24 hr operation. The first engine was put on the line for test purposes July 29, 1950, and the engine plant was officially energized on October 20, 1950; it is now on the line 24 hr a day as base load generators pending completion of steam plant.

In designing the plant, two objectives were kept in view: ability to quickly carry surging peaks or compensate for outage of the other power supply and provide kilowatt hours at low cost. In this plant, equipment and controls are arranged so they can be put on the line in less than a minute from a cold start with no outside power input. Starting air bottles are kept at 250 psi by an automatically controlled motor-driven compressor, but a gasoline engine standby can be used.

Engines chosen were 3500-hp, 10-cylinder, 18x27-in., two-cycle dual fuel units, which develop their rated horsepower at 277 rpm. Each unit drives a 2480 kw, three phase, 60 cycle, 4160 v alternator with a 30 kw chain-driven exciter.

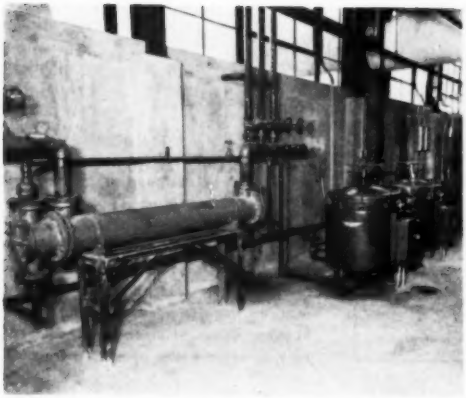
The plant is designed for automatic handling of lubricating oil. An 800 gal clean-oil tank is located in the basement for upper cylinder lube. A motor driven pump transfers this oil through a meter to individual 100 gal supply tanks, and then to two mechanical lubricators at each engine. A return line to the supply tank maintains the lubricator oil level. Engines are wet sump type and require approximately 1000 gal for the original fill.

### Lube Oil Treatment

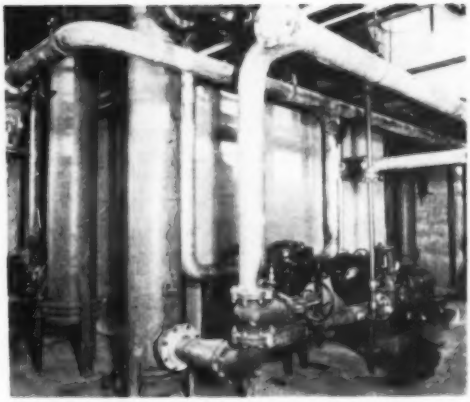
Lubricant is drawn from the crankcase by a motor driven positive displacement pump, which discharges through an oil cooler and strainer to the bearings. Lube flows up through the connecting rods to cool the pistons and returns to the sump by telescopic lines. Cellulose type filters are installed for each engine. When the engine is on line some lube is by-passed through the filter from the pressure system. During shutdown a motor driven pump draws oil from the crankcase and circulates it through the filter. The plant has an 1800 gal dirty-oil tank, and lube can be drained for batch purification if necessary. Pressure in the lube header is maintained at 30 psi, and temperature remains between 155 and 165 F with the aid of a modulating valve regulating the flow of water through the oil cooler.

These engines—designed as dual fuel units to burn natural gas with a small quantity of pilot oil—are currently being operated on oil pending completion of a natural gas line. Fuel oil—unloaded by a 100 gpm motor driven rotary pump—passes through an air eliminator and meter into three 50,000 gal vertical cylindrical tanks 700 ft from the plant. From storage it flows by gravity to the suction of two motor driven transfer pumps, which circulate oil through a heat exchanger and a pair of cellulose filters into a 17 psi header. From the header it passes through separate meters to 150 gal day tanks for each engine. Transfer pumps run continuously, and float-controlled valves admit oil to the day tanks as necessary. Fuel is picked up from day tanks by the engine supply pump and fed through a header to the injection pump at each cylinder.

For dual fuel operation there will be separate fuel pumps to meter accurately small charges of pilot oil. The en-



*Fuel handling is entirely automatic and includes a heat exchanger, two filters and two motor driven transfer pumps*



*Each engine has an oil cooler, strainer and motor-driven circulating pump. Treated well water is used for cooling*

# DURING STEAM EQUIPMENT ERECTION

**M. W. BOUDREAUX, *General Manager***

***Northeast Missouri Electric Power Cooperative***

gine can be switched instantly from oil to gas or from gas to oil and will be automatic in case gas pressure fails. The governor is arranged so that half its travel controls gas admission and the other half fuel oil.

Water for the steam plant will be taken from the Mississippi, but wells will provide water to cool the diesels. Three motor driven well pumps will each supply 425 gpm to a raw water header that discharges through modulating valves to the oil coolers and heat exchangrs and later wasted. Engines are cooled by a closed system filled with treated well water that is circulated by three motor drive centrifugal pumps. Some of this jacket water is routed to warm the fuel.

Scavenging air for each engine is drawn through an automatic self-cleaning filter in an air house outside the plant. A 2 in. vacuum is maintained in the crankcase. There are dual exhaust headers, and each serves five cylinders. The exhaust lines join and vent through a vertical silencer mounted on top of the air house. The release of engine gases is barely audible.

This plant has complete instrumentation both for operating ease and engine protection. The main switchboard includes voltage regulators, governor controls, synchroscope, oil circuit breakers, field switch, temperature indicator, a-c and d-c voltmeters and ammeters, kw meters and time-hour meters, which are energized when the field switch is closed. In the engine room there is a panel holding pressure gages on the starting air header, fuel oil header, cooling water header and cooling water suction. Here also are the control switches for two fuel transfer, two lube transfer and three water pumps. Alarms have been installed for low fuel pressure, low air pressure and softener regeneration. There is a separate panel beside each engine with a multipoint exhaust pyrometer and gages on fuel, lube, starting air, jacket water and gas.

All pilot lights, alarms, circuit breakers and emergency lighting are on a 120 v d-c battery set.

**PRINCIPAL EQUIPMENT OF NORTHEAST MISSOURI ELECTRIC POWER CO-OP**

| | | | |
|---|---|---|---|
| Diesel engines | Fairbanks, Morse & Co. | Fuel oil meters | Bowser Inc. |
| Alternators | Fairbanks, Morse & Co. | Fuel oil filters | United States Hoffman Machinery Corp. |
| Lubricators | Madison-Kipp Corp. | Governors | Woodward Governor Co. |
| Lube oil filters | United States Hoffman Machinery Corp. | Intake air filters | Continental Air Filter Co. |
| Lube oil pumps | Blackmer Pump Co. | Silencers | Maxim Silencer Co. |
| Oil cooler | Ross Heater & Mfg. Co., Inc. | Air compressors | Gardner-Denver Co. |
| Lube oil strainer | Elliott Co. | Switchboard | Westinghouse Electric Corp. |
| Well pumps | Fairbanks, Morse & Co. | Batteries | Gould National Batteries, Inc. |
| Jacket water pumps | Fairbanks, Morse & Co. | Battery charger | Westinghouse Electric Corp. |
| Water softeners | The Permutit Co. | Heat exchangers | Ross Heater & Mfg. Co., Inc. |
| Fuel oil unloading pump | Viking Pump Co. | Pyrometer | Illinois Testing Laboratories, Inc. |

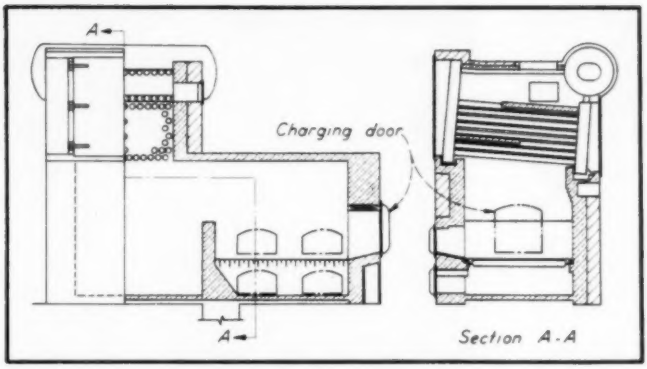



***Fig. 1—Original watertube boiler rated at 66 hp was designed to burn 600 lb of asphalt-base scrap per hr. Refractory arch, no water walls, no overfire air, rapid ignition, and high furnace temperatures contributed to serious refractory maintenance. The furnace was too small to permit complete combustion. Constant attention was necessary to avoid boiler operating troubles***

# COMBINATION SPREADER STOKER

## Successful two-stage furnace for coal and scraps of felt-base floor coverings indicates similar design will burn many other industrial wastes efficiently

WITHIN recent years, more and more attention has been directed towards utilizing combustible wastes for power generation. As the cost of basic fuels has increased, more methods have been devised for burning these cost-free wastes, at the same time getting rid of a costly disposal problem. Many waste products have been burned such as coal dust, coke breeze, black liquor, cork, jute and wood wastes, sawdust, bark, paper, spent hops, bagasse, cereal wastes, corn cobs and leather scraps.

Undoubtedly, in the future, we will witness the greater use of substitute fuels. However, we cannot overemphasize the fact that before a furnace is designed, these products must be carefully studied to determine their feasibility as suitable fuels for steam generation.

The chemical constituents of the proposed fuel, its volatile matter, moisture, ash, and calorific value all play an important role. The physical condition of the fuel is important since it must present no undue problem in handling and can justify little preparation prior to firing.

The above-mentioned factors will dictate the physical structure of the furnace, type of setting, type of arch, furnace volume and type of charging equipment.

Refuse burners now in existence vary greatly in design; but each may be classified as belonging to one of three groups: (1) A separate installation for burning waste only. (2) A unit burning a conventional fuel and waste on a common grate. (3) A furnace consisting of a primary and secondary unit burning a conventional fuel in one and waste in the other, the combined gases being conducted through a common boiler.

### Typical Waste Disposal Job

Typical of industrial waste disposal problems is that encountered at the Philadelphia plant of the Sloane-Blabon Corp., widely known manufacturer of felt-base floor coverings. This material is comprised approximately of 50 per cent wood pulp, 14 per cent rag stock and 36 per cent newsprint; specially selected blown asphalt is used as the impregnating material. For years, Sloane-Blabon has tried to develop a usable by-product from the scrap accumulated; being unsuccessful in this research, the scrap has been burned under a boiler.

The outstanding features of asphalt-saturated felt waste are its low moisture, high volatile and high calorific value. Its low moisture content eliminates the need for ignition arches commonly used in burning high moisture waste. Its high volatile content requires special attention, and adequate turbulence must be provided to obtain efficient smoke free combustion.

Although the high heat value favors the use of this scrap, its physical condition leaves much to be desired. The scrap is received in various sizes and shapes but usually in flat sheets 6 ft, 9 ft, or 12 ft in width, and various lengths; also, in rolls or in strippings 1 in. wide and lengths up to 180 ft. Preparation would, therefore, be necessary for mechanical firing.

Several attempts to hog the scrap were made by the Sloane-Blabon Corp. This proved hazardous to the operating personnel mainly because foreign objects—nuts, bolts, tools and the like—found their way between layers of scrap shattering the shearing knives and scattering the fragments in all directions. Because of the miscellaneous sizes of the scrap, these objects could not be economically removed before hogging. After experimenting, the process was abandoned and mechanical feeding ruled out.

It is appreciated that manual charging is not a strictly continuous process since fuel is charged periodically. It is interesting to note the phases accompanying the combustion cycle during charging. Immediately after firing, volatile hydrocarbons are distilled off the scrap. Because the scrap forms a mat, the flow of air through the grate is spotty. Overfire air must be used to provide turbulence and to provide additional oxygen to burn the volatile matter gasified. As combustion progresses, the asphalt, after giving up most of its volatile matter, swells and cokes. At this point, air introduced through the fuel bed supplies the oxygen needed for combustion. However,

Abstract of paper presented before the 1950 Annual Meeting of The American Society of Mechanical Engineers.

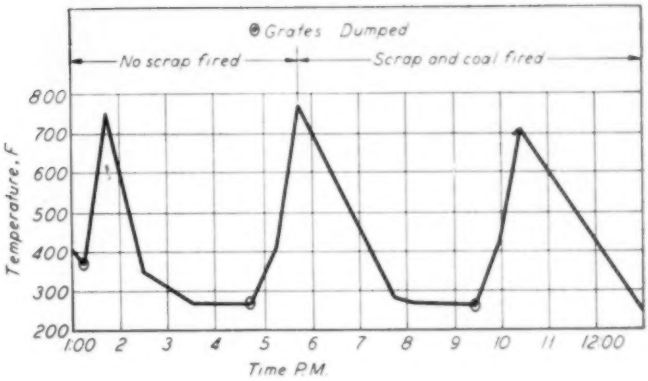



*Fig. 2—With combined burning of the scrap and coal, unusual conditions occur in the coal-burning furnace. As this graph indicates, the grates are subject to high temperature after dumping because new ash bed has not formed and furnace may be very hot as result of gases from burning waste. Difficulties were overcome by using special alloy instead of iron grates*

# AND WASTE-FUEL FURNACES

**F. C. MASSAROS**

***American Engineering Company***

● With the steam-generating equipment herein described, it is estimated that between 15,000 and 20,000 lb of steam per hr, representing 17.9 to 23.8 million Btu reclaimed per hr, can be generated by burning scrap alone. The economic advantages of generating 20,000 lb per hr of nearly cost-free steam are obvious; in fact, savings in fuel consumption alone have already justified the capital investment in the equipment. Also deserving of comment is the saving in initial cost of a combined furnace over two separate furnaces, each built for burning its own respective fuel. These facts are discussed at length in the article.

as indicated previously, difficulty arises in that, even at this stage, the undergrate air cannot be evenly distributed through the fuel bed. If this could be accomplished near the end of the burning period, a decrease in the amount of overfire air would be warranted. However, the scrap material fired here does not justify a change in quantity of undergrate air since its path cannot be directed. A satisfactory solution appears to lie in deflecting a portion of the overfire air evenly over the top of the fuel bed. As burning proceeds, the fuel bed must be occasionally barred to expose unburned coke to the air.

## Outmoded Equipment Replaced

The first attempt to burn this material was made approximately 40 years ago. In 1938, general modernization of existing power plant facilities resulted in the construction of a separately hand-fired scrap burner in addition to two boilers fired by multiple retort water-cooled underfeed stokers. The refuse burner installed under a 66-hp watertube cross-drum boiler is shown in Fig. 1. This unit used stationary grates and had a furnace volume of approximately 350 cu ft. Scrap was hand charged through a rear door. The absence of watercooling and the presence of a refractory arch produced a hot furnace which favored rapid volatilization of hydrocarbons and rapid ignition. However, the high temperature on the walls caused serious refractory maintenance.

Although the unit was designed for

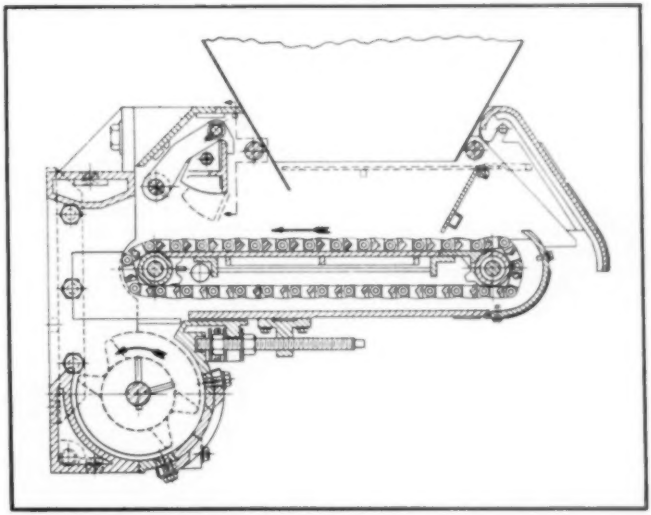


*Fig. 3—With combined scrap and coal firing, extremely low coal-burning rates of fine wet coal are often required. This was met by high-capacity feeder and drive which has feeding range from 50 to 7500 lb of coal per hr*

burning 600 lb of scrap per hour, the furnace was apparently not large enough to permit complete combustion. It is noteworthy that no overfire air was supplied above the grates. To avoid operating difficulties constant attention was necessary.

During the post World War II period, increased floor covering production followed the general industrial trend and soon consumer demand dictated general plant expansion. Estimates of present and future steam requirements indicated that existing steam boiler capacity would be inadequate. Analysis of boiler-room facilities showed an additional 50,000 lb steaming capacity should be added. It was felt the expansion should include replacement of the scrap-burning unit with a more efficient unit capable of consuming a greater amount of scrap.

### Two-Stage Furnace Adopted

The decision was reached to provide a two-stage furnace, one stage of which would be charged with scrap and the other with coal. It was felt that such an arrangement would be more effective as initial gasification and partial combustion of the scrap would take place in the first stage and combustion of these gases completed in the second stage. The gases of both scrap and coal would then enter the common boiler. It was also recognized that adequate furnace volume and turbulence should be provided to control smoke. Moreover, if the secondary or coal furnace was mechanically charged and automatically controlled, swings in load could be easily handled. Furthermore, costly shutdowns and light-offs would be prevented since, if no scrap was available, coal alone would carry the load and if scrap was available, the two could be fired simultaneously.

The previous successful experience with underfeed stokers naturally led to a study of using these in connection with burning felt-base scrap. The inclined grate of the multiple-retort underfeed stoker plus the interference with normal combustion conditions along the side wall adjacent to the scrap-burner side of the furnace that would occur with a stoker of this type led to consideration of the dump-type spreader stoker.

The spreader stoker with its flat grate made it easy to combine the felt-base waste furnace with the coal-fired furnace. The decision was made, therefore, to employ a spreader stoker.

The Sloane-Blabon Corp. had enjoyed the opportunity of purchasing the most economical coals available because of the versatility of the water-cooled underfeed stoker. Naturally, they wished to continue this advantage but the question arose as to whether they would be able to feed the fine wet coals they would want to use at times without clogging or stuttering the spreader stoker feeder. This led to the selection of the feeder shown in Fig. 3. In this type feeder, the whole chain conveyer under the coal hopper moves toward the furnace almost continuously. A further problem was the necessity of having reliable and steady coal feed at extremely low burning rates when most of the steam was generated by burning waste. This requirement was met by the use of a high-capacity drive box which offered a coal-feeding range of from 50 to 7500 lb of coal per feeder per hour. Although the top range of this feed is in excess of that required, the bottom range serves admirably in view of the low coal-burning rates encountered when burning the combination of scrap and coal.

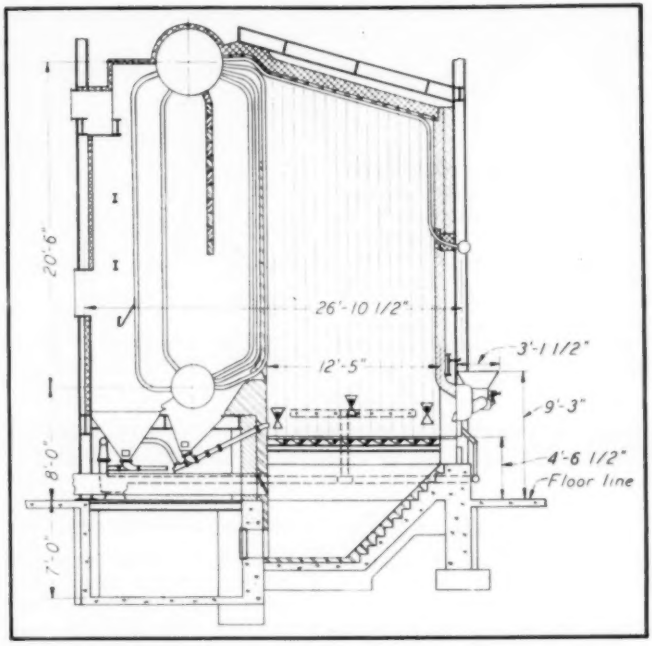



*Fig. 4—Details of 25,000 lb per hr boiler and two-stage furnace for mechanical firing of coal and hand firing odd-sizes of scrap floor coverings*

### Features of New Boiler

The boiler installed is of the Edge Moor two-drum bent-tube type, Fig. 4, with 7490 sq ft of heating surface, employing neither economizer nor superheater. It is equipped with a 3000 sq ft tubular air preheater designed for 300 F preheated air. The furnace is watercooled with a total of 1330 sq ft of watercooling in front, rear and side walls. The furnace volume of 3575 cu ft is more liberal than would be required to burn coal alone. The spreader stoker is equipped with three chain conveyer type coal feeders as described previously. The chain feeder delivers coal to an overthrow rotor of spiral design which, due to its curvature, distributes coal evenly throughout the furnace. The unit is equipped with cinder and flyash reinjection equipment as well as overfire air nozzles as shown.

The primary or scrap furnace, Fig. 5, measures 8 ft 8⅜ in. wide and 12 ft 1 in. in depth. The furnace is watercooled on side wall and roof. Front and rear walls are of refractory construction. The unit employs manually operated dump grates having a projected grate area of 97 sq ft; furnace volume of 1250 cu ft is provided. Ten adjustable overfire air nozzles are located in the side wall 3 ft 3½ in. above the grate line and provide overfire air for smoke free combustion. A high-pressure fan capable of delivering 10,000 cfm at 15 in. static pressure was selected to supply the overfire air; however, only a portion of this quantity is needed for satisfactory operation. Preheated primary air at 300 F is used under the scrap-burner grate as well as under the coal-burning grate with separate damper regulation to each.

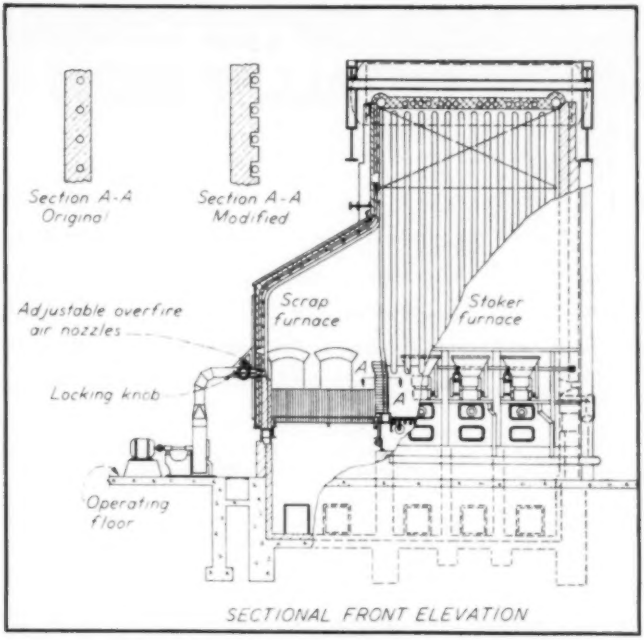



***Fig. 5—Primary furnace now permits complete combustion of scrap. It has watercooled roof and side walls; front and rear wall are of refractories***

Partial separation of the scrap burner and stoker furnace is accomplished by a watercooled curtain wall, refractory covered to a height of approximately 4 ft above the grate level.

It should be mentioned that the curtain wall tubes are widely spread to permit the scrap-burner gases to pass into the stoker furnace without restriction. Due to physical conditions in the region of the boiler unit, the scrap is charged at the rear of the setting through two large openings each 32 in. square and equipped with vertical lift firing doors.

### Operating Characteristics

This boiler unit has been in operation since March, 1949. Difficulties were encountered with deterioration of the stoker side of the refractory pier separating the primary and secondary furnace even though the curtain-wall cooling tubes extended through this pier. The pier was corrected by removing part of the refractory on the stoker side, thereby exposing greater tube surface for better heat transfer, as shown in the enlarged detail at top of Fig. 5. The greater cooling reduced brickwork deterioration and after approximately a year's operation, the wall still appears in good condition.

Conditions in the coal-burning furnace are unusual. The more waste burned, the less coal required. The furnace may be very hot as the result of burning waste gases, yet the amount of coal fed on the grate and the flow of cooling air through the stoker grate is low. This condition subjects the stoker grate to severe punishment, especially after the dumping period. Stoker grate temperatures were investigated and thermocouples were installed at several points in the grate. Fig. 2, variation of stoker grate bar temperature with time, indicates a peak temperature of approximately 750 F reached within 30 to 60 min. after the fires are dumped. In other words, after cleaning, the grate iron was subjected to intense heat from direct contact with live coal. The resultant rapid temperature rise continued until sufficient insulating ash was deposited. When this occurred, the rate of heat absorbed by the grate was less than the rate of cooling by under-grate air. The temperature then decreased until it approached that of the under-grate air.

It will be noted that the grate reached the same approximate peak temperature whether or not the scrap burner was fired. However, it is clear that when the scrap was carrying part of the same steam load, it took longer for the grate temperature to return to that of the preheated under-grate air. The reason for this is that the lower coal-burning rate necessarily required a longer time to form a protective coat of ash. Since steam loads of only 18,000 of 25,000 lb per hr are carried on this boiler during the summer, it was felt that grate bars of special alloy would be desirable since light coal-burning grates would result in iron being exposed to high temperatures for prolonged periods. Accordingly, a special iron alloy grate was developed and installed. This grate has now seen 9 months of service and definitely indicates a considerably longer life factor than could be expected with a grate of conventional material under the unusual conditions to which these grates are subjected.

Because of the high volatile content of the scrap, as well as the difficulties experienced with preceding scrap-burning units, the use of overfire air obviously was necessary, but it was decided that the overfire air nozzles proposed for the stoker furnace should provide sufficient turbulence for the scrap-burner gases as they entered the stoker furnace. However, the turbulence realized from this was not adequate and a bank of 10 adjustable air nozzles was installed in the side wall of the scrap burner. This addition improved the stack materially. Although the present arrangement does not direct part of the air onto the top of the fuel bed, alterations to allow this are contemplated in the near future. Adjustible features of the nozzles allow ready adjustment of penetration to meet local conditions in the furnace.

## Cities Service Refinery

● Our cover this month shows the recently modernized Cities Service refinery at East Chicago, Ind. New towers that stand clear against the skyline include a giant "cat" cracker erected as a part of the $18,500,000 expansion program. A new $3,000,000 delayed coking unit takes crude oil, reduces carbon and coke content, and charges 14,760 bbl each day into the fluid catalytic cracker to produce high-octane gasoline and distillate fuels.

To handle increased production, boiler house equipment was added to increase generation of process steam from 100,000 to 300,000 lb per hr. An existing 36-in. pipeline was supplemented by a new 54-in. line to bring 100,000 gpm of process and cooling water to the plant from Lake Michigan.

INDUSTRY AND POWER acknowledges cooperation of Cities Service in providing this month's cover illustration.

# LOAD CENTER COMING? INSTALL IT RIGHT

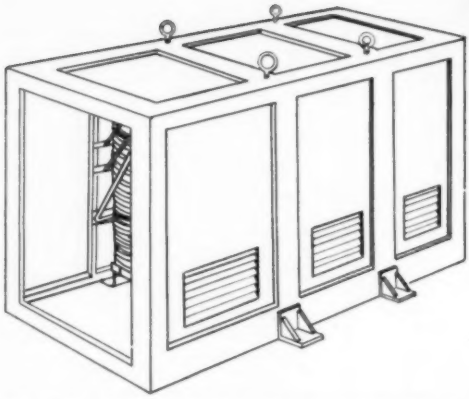


**Fig. 1—See that special aids, such as eyebolts and angles provided by shipper are used. Avoid strains on weaker parts**

**Most critical period for a unit substation is the short time between arrival and energization. Handling, storage and assembly are major factors in obtaining long, efficient service. Be ready with the best methods and equipment when the apparatus arrives. The first of two installments**

**GEORGE WOOD, *Substation Section***
***Allis-Chalmers Manufacturing Company***

A LOAD center unit substation consists essentially of a transformer and one or more sections of low-voltage, metal-enclosed switchgear, as well as high-voltage gear in some cases. The switchgear portion, unless it is quite small, may be divided into shipping groups for convenience in transporting and handling.

Shortly after a load center unit is shipped from the factory, the purchaser is notified by his factory representative. Routing, car number or numbers, name of carrier and estimated time of arrival are given in the advance notice so that preparations may be made for receiving the shipment.

Before any attempt is made to unload, uncrate, handle or install the substation, the person responsible should study and fully understand directions given in the instruction-book drawings sent out in advance. In some cases, instructions pertaining to individual parts of the equipment will be printed on tags attached to the actual pieces. Watch for such tags.

Substation outline and floor plan drawings show size and weight of each component of the station. These should be carefully reviewed prior to the unloading operation, so that adequate equipment is available for unloading, transporting and positioning.

Upon arrival, either the substation will be immediately erected or it will be stored.

Immediate erection is preferable, since it assures prompt attention to the equipment, although it may be safely stored if certain general requirements are followed. Storage in a room having little variation in temperature is the most ideal for all types of transformers and switchgear. Under no circumstances should the equipment be left on a flat car or a shipping platform without taking the basic protective measures described herein. Storage outdoors is permissible under the following conditions.

### Temporary Outdoor Storage

*Transformers* require these precautions:

1. Throat openings of outdoor liquid-filled units should be covered to exclude moisture or foreign matter from the throat.

2. Indoor liquid-filled power transformers must be completely covered with tarpaulins.

3. Outdoor dry-type power transformers must have throat openings covered and the interiors kept above the ambient temperature by electrical space heaters energized by an external power source.

Outdoor storage of indoor dry-type transformers is not recommended.

*Switchgear* in the outdoor high-voltage metal-clad or outdoor low-voltage metal-enclosed classes may be stored outdoors provided:

1. Throat opening are covered with tarpaulin to keep out rain and foreign matter.

2. The built-in space heaters are energized by an external power source during outdoor storage.

3. The gear is placed on relatively high ground where water will not collect under or around the gear. Rails, blocks or timbers should be placed under the gear unless it is on a smooth hard surface such as concrete.

Outdoor storage of indoor switchgear is not recommended. However, if imperative for a short time only, the switchgear must be completely covered with tarpaulin and electric heaters placed in each compartment. Inspect

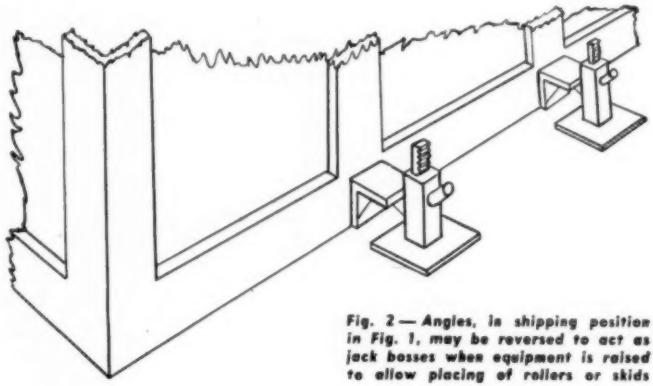


**Fig. 2 — Angles, in shipping position in Fig. 1, may be reversed to act as jack bosses when equipment is raised to allow placing of rollers or skids**

frequently for moisture inside, around or under the gear.

In addition to unloading and handling instructions, other data such as general arrangement drawings, floor plans, writing diagrams and other pertinent information are supplied for each installation, and should be studied by the person responsible for the installing and servicing of substations.

### Preliminary Examination

1. Examine the shipment as thoroughly as possible before accepting and unloading. Make a record of any evidences of maltreatment since it may be helpful to substantiate claims for shipping damages discovered later. If damages are evident, immediately file a claim with the carrier, and promptly notify the factory representative of the manufacturer.

Equipment of this type is generally purchased f.o.b. factory with freight prepaid to railroad siding nearest first destination within continental USA. Claims for damages during shipment must, therefore, originate from the consignee after arrival and inspection of the shipment. It is the responsibility of the carrier to deliver equipment in good condition from factory to destination; it is purchaser's responsibility to ascertain that gear arrives in good condition, and to initiate claims for shipping damages if it has been damaged enroute.

2. Instructions should be shipped with the equipment. Before unloading, ascertain if they have been included. If so, examine them before proceeding further, since special handling precautions may apply to a particular shipment—especially if the unit is complex.

3. Check the shipping manifest to see that all listed items are included.

### Unloading from Flatcars

Remove only the spikes, locks, shipping braces and rods which secure the equipment to the flat car or truck. Do not remove or loosen braces or shipping channels on the gear itself, unless necessary in order to move equipment from the car. Many such bracing members must remain in place until after final positioning.

*Transformers,* both the liquid-filled and heremetically sealed dry types, are generally equipped with lifting hooks. Non-sealed dry type transformers normally have eye-bolts. Both types are equipped with jack bosses. Whenever overhead lifting apparatus is used, a cable spreader in the hitch is necessary to minimize lateral stresses.

In some cases, jack bosses on dry-type transformers may be used as shipping braces. When this is the case, as illustrated in Fig. 1, the jack bosses must be unbolted from the transformer sills, rotated 180°, and re-bolted as in Fig. 2. They are usually painted a distinctive color, signifying they are to be removed after final positioning.

*Primary Switches* of the liquid filled, manually operated type are usually shipped with and attached to the transformer (which invariably is the liquid filled type). Unload and handle the switch and transformer as a unit.

Free-standing air-immersed switches, and switch and fuse combinations, are shipped unattached and protected during shipment by a simple crate and covering. Air-immersed switches are mounted in a sheet steel enclosure with removable sides. They should be handled with the same precautions applicable to indoor metal-clad or metal enclosed switchgear as outlined below.

*Indoor Switchgear* is prepared for shipment in a number of ways depending on destination, method of shipment, route traveled and other factors. The more common methods include mounting on a wooden skid and (a) covering with tarpaulin (usually used only for local or very short hauls via truck), (b) covering with water repellent paper or paper board in an open wooden crate and (c) covering with water repellent paper or paper board, and completely boxed.

### Lifting Attachments

In all cases, the gear is equipped with eyebolts (Fig. 1), lifting channels on or across the top, or other special lugs to which slings must be attached. Do not put a hitch around a group of gear and lift. Eyebolts or channels for lifting should not be removed until after final positioning.

If lifting equipment is not available, each switchgear shipping group can usually be moved either by skidding or using rollers. Skidding is permissible only over smooth hard surfaces. Cables or chains must be attached to the runners of the shipping skid and *not* to the switchgear itself. Use a cable spreader in the hitch to prevent undue compressive forces on the cross-bracing members of the skid which may otherwise collapse, resulting in distortion of the switchgear framework.

### Cable Connections

Chains or cables used for skidding a group of switchgear are best attached to the skid runners by drilling a ½ to ¾ in. hole in one of the projecting ends and inserting a steel peg, large bolt or spike to which the chains or cables may be fastened. A satisfactory cable spreader consists of one or two timbers (2x4 in. or heavier, depending upon the size of the group to be skidded). The timbers should be notched at each end and their length should approximately equal the distance between the two skid runners.

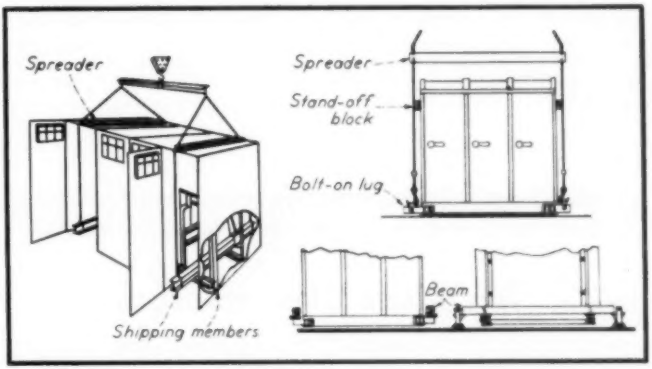



***Fig. 3—Shipping members, left, or bolt-on lugs, right, may be provided. Always use spreaders and stand-off blocks on lift cables. Beams secured on top of lugs with U-bolts or cables, lower right, allow use of jacks for placement of rollers***

*Outdoor Switchgear* is generally shipped on wooden skids secured by open framework crating. All equipment openings, such as throats, control wiring openings and cable entrances, are carefully sealed against entrance of water or foreign matter.

Most makes of outdoor switchgear are designed to be lifted from the bottom. Most generally used methods are:

(a) Temporary lifting lugs are supplied for bolting to the horizontal switch gear sill channel iron. Lifting apparatus may be attached to the pro-

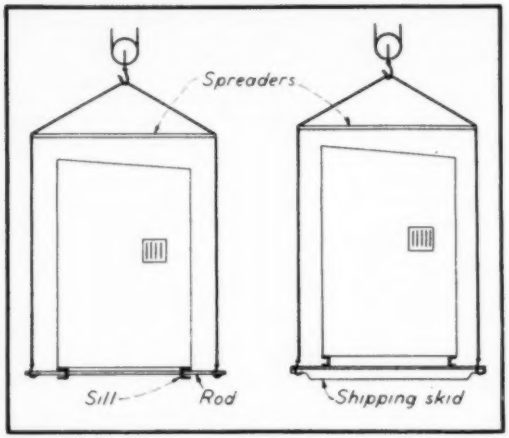



***Fig. 4 — Other means of attaching lifts include holes for rods through sill channels or skids, and special skids designed for this use and supplied as the shipping pallet***

jecting ends of such lugs, and by use of cable spreaders and cable stand-off blocks, the gear can be lifted, Fig. 3.

(b) Liffting bars or pipes are sometimes used, requiring a 7 to 10 ft, 2 in. steel pipe or rod inserted through holes in the ends of each switchgear sill channel. Lifting apparatus can then be attached to the projecting rod ends. It is essential that the cables be spread above the gear, as in Fig. 4, to prevent rubbing or chaffing.

(c) Where switchgear is shipped on a skid, the entire group can usually be lifted by the ends of the shipping platform. Be certain, however, to use a spreader above the gear and to attach the hooks to a substantial portion of the shipping skids, as illustrated in the sketches in Fig. 4.

If lifting equipment is not available, each group of outdoor switchgear can usually be rolled or skidded short distances. When moving more than a few feet, it is most advisable to leave the gear on its shipping platform.

To lift a group of switchgear a few inches for roller placement, it is generally permissible to raise one end at a time by use of pinch bars under the sill channel, or under runners of the shipping skid. However, it is important that such lifting be properly performed to avoid distorting or damaging the switchgear. One approved method of lifting raises the same end of both sill channels or skid runners equally and simultaneously with crowbars. Do not raise one skid at a time, as this will rack the unit and strain the framework.

Removal of rollers is accomplished by the reverse of the method described above. The assembly must be lowered carefully, for it may not withstand the shock of dropping, particularly dangerous for meters and relay instruments.

*The last part of the article will describe the precautions necessary during the actual installation. It will appear in an early issue.*

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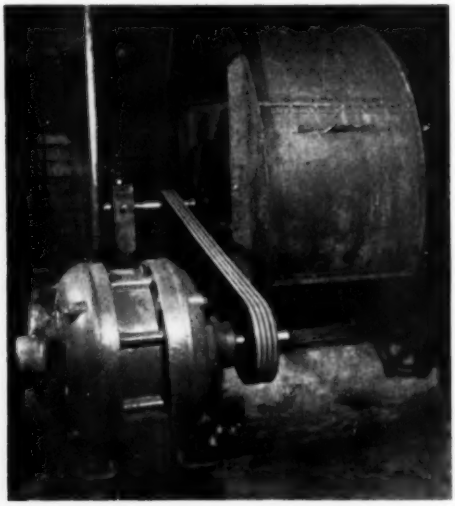
★ **WHAT TO DO UNTIL THE DOCTOR COMES**

# *Try to Use Standard Equipment in Emergencies*



• A short circuit in the high speed winding caused failure of a double winding 30 hp motor, direct-connected to a forced draft fan for an 80,000 lb per hr, 600 psi watertube boiler located in the plant.

As this was a single unit and designed primarily for forced draft, outage of the fan meant shutdown of the boiler and total loss of mill production. No replacement motor was available either from the manufacturer or from the dealer in new and used equipment. To make a set of coils and rewind the motor would take approximately 30 days.

With these facts in mind, plans were made at once to obtain a standard 30 hp induction motor and belt it to the driven fan. Within a 24 hr period, the equipment shown in the picture was obtained from a used motor company and a mill supply outlet and the plant placed back in operation under full production conditions.

The motor and drive functioned so well that after the original motor was rewound, it was kept in stock for emergency use. The fact that the equipment used for the replacement drive was standard and could be instantly secured in the open market meant the difference between a plant in full operation and one shut down. In other words, plan if possible, to avoid special apparatus when faced with the problem of placing a factory back in operation in the least possible time.—*The Condenser.*

# PROPER APPLICATION OF FLAT RUBBER BELTS MEANS SATISFACTORY SERVICE

**Endless rubber flat belts when vulcanized together meet the requirements for both group and individual power transmission systems. Here, several applications illustrate the economies obtainable through long service**

**FRANCIS WESTBROOK, M.E.**

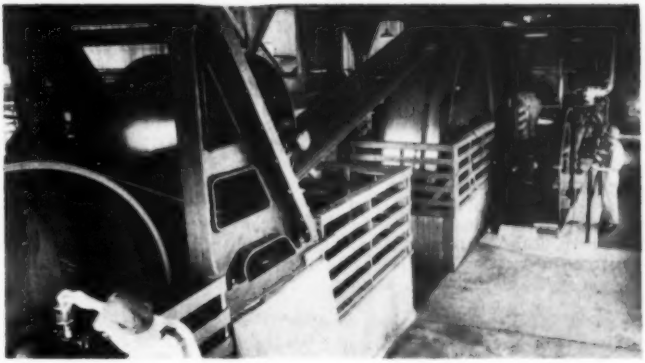


*Fig. 1—Idler pulley takes up slack on this 32 in. wide, ten-ply 99-ft belt*

FLAT-BELT DRIVES have in many cases been superceded by other types of drives, but they are still widely used and give good service when properly installed in suitable locations. The record shows that they may be depended upon where carefully worked out production schedules are involved, as can be seen by considering a few successful installations.

This discussion deals with the endless rubber power transmission belts that require splicing. However, this is a simple operation and calls merely for careful workmanship. The plies on the two belt ends are stepped down so that they match. Cement and tie gum are then applied, and the ends are fitted together, pressed and heated in an electric vulcanizer. In some instances the splices are made on the drive, and then portable vulcanizers are used. Other tools required are few and inexpensive, and the vulcanizers are simple to operate. The finished product calls for little or no attention while in operation.

Fig. 2 shows the main drive shaft of a cylinder type kraft board machine in a Southern paper mill. This machine, which has a nominal width of 124 in., is composed of five cylinders, four primary presses, two main presses, seventy-two 48-in. dryers and two calender stacks. All of these are driven from a common lineshaft, which is direct-connected to a 300-hp, 350 to 500

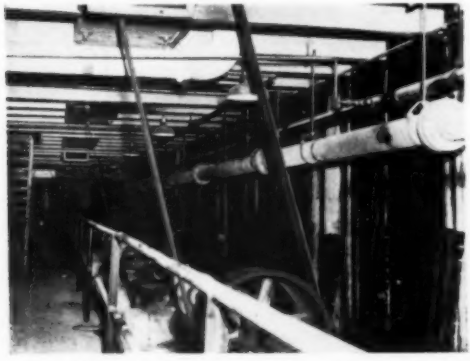


*Fig. 2—Lineshaft of this group-drive contains 18 babbitted bearings and is powered with a 300-hp 250-v motor*

*Fig. 3—Nine-ply flat rubber belt, delivering power to a breaker beater, has been in constant operation for 17 years*

rpm, 250-v d-c motor. There are 18 babbitted bearings on this lineshaft.

Belts are of the endless vulcanized type, eight ply, raw edged and heat resistant. The drive is located in a tunnel below the machines where atmospheric conditions are usually humid, and at times quite damp. No special measures have been taken to overcome the dampness, although there is a large exhaust fan at one end of the tunnel that is used during the summer months when this area becomes very hot.

### Humidity Effect

Where there is a uniformly high relative humidity of around 75 per cent or more, the condition is favorable to maintaining a uniform belt tension. There are cases on record where properly installed endless rubber belt drives have operated satisfactorily for several years without take-up. However, a general statement that such will always be the case cannot be made. But, the plant engineer or millwright in a given plant will often be able to tell from his personal knowledge of the various local conditions whether an endless belt can be used to advantage where there is no idler, motor with movable base or other means of taking up slack.

Most belts, whether of rubber, leather or plain fabric, will act differently at different temperatures and humidities. In damp or humid locations there may be considerable stretch or shrinkage. When a belt is to operate under such conditions it should be placed loosely in the roll for several days where similar conditions exist. Then the changes in dimensions can take place before it is cut to length.

Fig. 3 illustrates a 28 in. wide flat rubber belt spliced endless on the drive for a breaker beater delivering over 150 ton of paper stock 24 hr per day, for more than seventeen years.

This belt has nine plies, is 60 ft, 4 in. long and is driven by a 250-hp motor at a speed of 2500 fpm. The motor pulley is 22 in. in dia and the pulley on the beater 122 in. in dia. Both pulleys have a face width of 30 in.

Of particular interest is the fact that none of the flat-belt drives so far discussed have been equipped with idlers. In one power transmission application in a Texas paper mill an idler has been provided but not used. The mill operators were not convinced that the belt, spliced on the drive, would not stretch; hence, they insisted on a standby idler. However, after many months of operation was found not necessary.

On the other hand Fig. 1 shows a drive in a southern sawmill, and an idler is used. This belt is 32 in. wide, ten ply and 99 ft long. It also was spliced endless on the drive.

### Cone Pulley Application

Fig. 4 shows a drive for a Fourdrinier paper machine. Various sections are driven from a common lineshaft in the basement, and required changes in the speed of each section are obtained by using taper cone pulleys on the lineshaft and different machine sections.

This belt is 8 in. wide, has eight plies and was installed endless on the drive. The photograph was taken twelve years and seven months after the belt was installed. During that time it has run continuously 24 hr per day, always six days per week and a good portion seven days a week.

### Variable Speed Arrangement

The lineshaft is driven by a direct-connected variable-speed motor rated at 80/250 hp, 145/550 rpm. The slowest operating speed of the machine is at 173 rpm for the lineshaft. This gives a paper speed of 240 fpm. The highest speed is 450 rpm on the lineshaft, corresponding to an equivalent paper speed of 625 fpm. The average lineshaft speed is 414 rpm, and this corresponds to a paper speed of 575 fpm. At the slowest machine speed the belt travels at 1530 fpm, and at the maximum speed of 3980 fpm.

This drive consists of a 32½ in. by 34-3/4 in. dia cone pulley on the lineshaft and a 33-7/8 in. by 36-1/8 in. dia cone pulley on the machine. Both pulleys have a face of 36 in.

The appearance of a splice made endless on the drive for a chipper mill in a southern paper mill is seen in Fig. 5. The chipper drum flywheel, at the top of the illustration, weighs 18 ton. The belt is 26 in. wide, nine ply and 49 ft 10 in. long. It is driven by a 300-hp induction motor at 750 rpm.

Examples of long belt life in other industries could be cited. Probably the service conditions in the paper manufacturing field are, however, as exacting as any except in very exceptional cases. The qualities discussed are quite likely to be found useful in most instances where flat-belt power transmissions are under consideration.

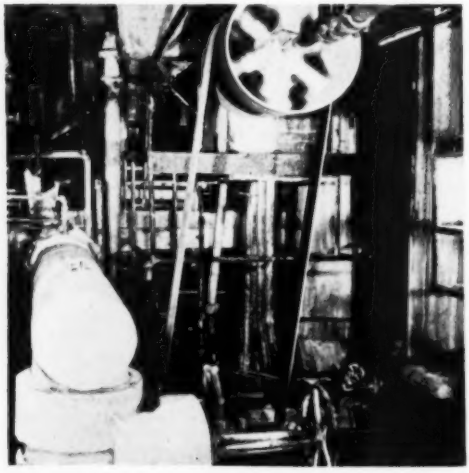


***Fig. 4—Tapered cone pulleys on lineshaft and machine sections permit a variance of speed from 145 to 550 rpm***

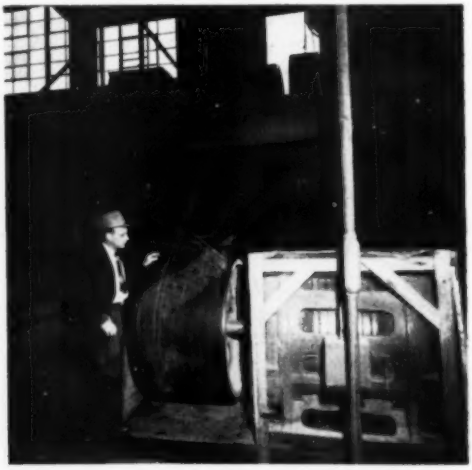
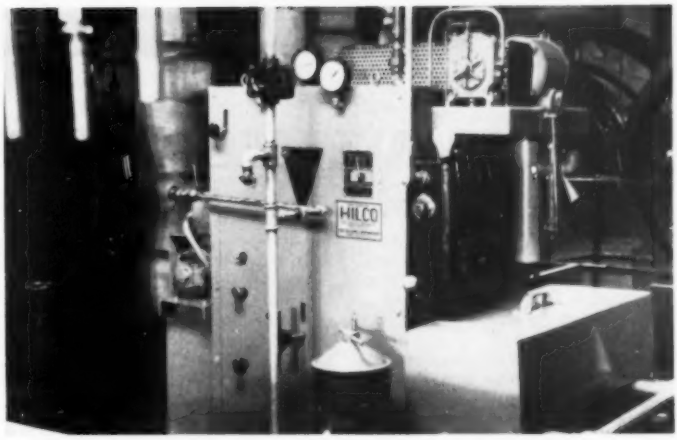


***Fig. 5—Chipper-drum flywheel, which weighs 18 ton, is driven at a 750 rpm speed by this 26-in. nine-ply belt***

*Dirty oil from one of three tanks is pumped to purifier and reconditioned. Yearly savings have averaged $1,500*




- Lube oil is purified for eight reciprocating engines and two large ice machines
- Dirty lube oil is treated at a batch center consisting of a purifier, transfer pump, three contaminated oil and eight clean oil storage tanks

# PURIFY LUBE OIL . . . . . AND LOWER OPERATING COSTS

**WILLIAM H. GOTTLIEB**

***Morrison-Gottlieb***

ONE OF THE NATION'S six major meat packers, Cudahy Brothers, Inc., is effecting a net saving of more than $1500 a year through use of a purifier to reclaim a wide variety of lubricating oils. An additional benefit is the maintaining of lubricants in peak condition with resultant improvements in protection to the production equipment served.

Oil purification has been widely accepted in power plants where large quantities of lube are circulated to engines or turbines, and where purifiers can be arranged for continuous service in the circuit. But the industrial plant using relatively small quantities of several special-purpose lubricants has had the tendency to feel that oil reclamation would not be physically practical or economically feasible. Cudahy demonstrates how purification equipment can be set up to meet this problem and proves that worthwhile savings can be achieved with such a system.

## Oil Grades

Principal equipment served at this plant includes eight reciprocating steam engines driving five ice machines and three generators and two steam turbines driving ice machines. Three principal oils are used: heavy and medium for engine crankcase and crosshead lubrication and special heavy for the ice machine compressors. Other oils are reclaimed as necessary.

To handle purification of the various lubricants, the company has set up a flexible batch treatment center with a purifier, motor-driven transfer pump, three contaminated-oil tanks and eight elevated clean-oil tanks.

Periodically, a batch of oil is taken out of service and pumped to one of the contaminated-oil tanks. The pump then delivers the oil to the purifier, which eliminates both dilution and solid impurities and provides usable oil.

## Parallels Refinery

Actually, the purification process is similar to the original refining of the oil with both contact filtration and fractionation. The oil is mixed vigorously with fuller's earth for removal of suspended solids and oil oxidation products. At the same time, it is heated by means of thermostatically-controlled electric heater banks and is subjected to a 25 to 26 in. Hg vacuum. This low pressure vaporization serves to remove fuel dilution, moisture, organic acids of low molecular weight and other volatile contaminants with a lower boiling point than the oil. Employing a vacuum reduces the temperature required to vaporize the volatile impurities and avoids possible thermal decomposition of the oil. Also, it cuts the time necessary for refining a batch of oil. On the average, a batch can be processed every hour.

When vaporization is complete, the oil mixture is dropped into a run-down tank. It is then forced by compressed air through a primary and later a secondary filter press to remove the fuller's earth and adsorbed impurities. The over-all result of the process is to restore the oil to a new-oil condition.

## Storage Identification

After purification, the oil is pumped up to one of eight clean tanks and returned to service by gravity. Large identification plates are hooked to the tanks to identify the various oils. Once a month, a sample of each lubricant is subjected to laboratory analyses; gravity, viscosity, flash point and acidity are compared with specifications for new oil. Frequency of purification may be altered as indicated by the condition of the oil after an analyses is made.

## Lube Oil Savings

This new service has resulted in a saving of approximately 100 gal of oil per week. However, there are other economies. Miscellaneous oils, including that drained from truck crankcases, are put through the purifier and used for hand oiling. More important, though, is the plant's ability to keep lubricants in good condition at all times. In plants where oil is used and discarded, inevitably the equipment served has the same degree of dirt. Continuous maintenance keeps both oil and equipment clean, thereby reducing wear and overhead costs.

# TETRAFLUOROETHYLENE RESIN

TETRAFLUOROETHYLENE resin (Teflon), one of the newest plastics, offers many possibilities with its high resistance to heat, chemicals and moisture. Used as a tank lining it will withstand the effects of practically all known chemicals up to 500 F. Exceptions are molten alkali metals like sodium and, under certain conditions, fluorine. It can be made in suitable forms for sprayed coatings, wire enamels, extruded products, tape and film, glass-cloth coating and raw suspenoids.

For electrical insulation at commercial and high frequencies and elevated temperatures, or for use as gaskets and packing the resin offers a combination of properties not previously available in one single material.

As insulation in transformers and motors it permits operating them at temperatures up to 500 F. This means output can be increased 25 to 50% or, for the same output, the physical size can be reduced. Electrical insulation can be in the form of wire enamel or extruded covering and, when made in reinforced sheets and tape, is suitable for slot liners, armature wrapping and layer insulation. Its resistance to surface arc-over is good and, upon failing, it melts and vaporizes rather than carbonizing to leave a conducting path.

Glass fabric coated or impregnated with the resin, and laminated as needed, can be used for conveyer belts, gaskets and flexible ducts for hot corrosive gases. Its anti-sticking qualities make it a good coating for conveyer surfaces, rolls, containers, etc. handling sticky material in process.

Solid gaskets are made by (1) die cutting from a molded sheet, (2) slicing from the end of a molded cylinder, or by molding directly from powder. They can be installed in simple flanges for pressures up to 300 psi, but for higher pressures tongue-and-groove, or male-and-female flanges should be used to confine the gasket. Calculation of required bolt loadings for solid gaskets may follow the procedure suggested in the 1949 ASME Boiler Construction Code, Section 8, Appendix 3.

Envelope gaskets containing a soft filler meet the needs for glass, porcelain and glass-lined equipment where misalignment and low bolting pressure will not seat the solid variety.

Spiral-wound metal with a plastic filler makes a gasket specially suited for high pressure chemical service. A newer type gasket is made by impregnating asbestos paper with the material. Gaskets made from the plastic have been used successfully in contact with bromine, chlorine, sulfur dioxide, concentrated sulfuric acid, aqua regia, thionyl chloride, organic solvents including halogenated hydrocarbons, etc.

For packing pumps and valves the material can be made into solid or tapered-wedge rings, braided (twisted ribbons with or without asbestos yarn) and a mixture of the powder and binder. As a packing, tetrafluoroethylene plastic offers chemical inertness, heat resistance and low coefficient of friction. It gives an excellent account of itself on such packing jobs as pumps handling corrosive butyl extract and operating at 3,600 rpm, fuming sulfuric acid, strong caustic solutions and operating at 2,000 rpm, saturated ethylene-diamine tartrate, diacetone, and cold silicon tetrachloride at pressures from 2,000 to 2,500 psi.

Although the material has a low coefficient of friction, its low thermal conductivity retards the dissipation of frictional heat and its high coefficient of thermal expansion has the undesirable effect of reducing clearance as the temperature increases. These characteristics divide the design into two applications—low speed (rubbing speeds below about 150 ft per min.) and high speed (rubbing speeds above 150). The rubbing speed is only approximate and variables such as shaft alignment, stuffing-box length, shaft diameter and shaft surface finish can set the limit higher or lower.

Where the design is for high-speed service an annular space must be maintained along the shaft to prevent contact with the packing. In installation, the packing is "run in" carefully, keeping it cool, until a small uniform annular space is formed along the shaft. The fluid being pumped, or fluid introduced through the lantern ring flows along the space and cools packing and shaft. *Courtesy of E. I. du Pont de Nemours & Company.*

**PROPERTIES OF TETRAFLUOROETHYLENE**

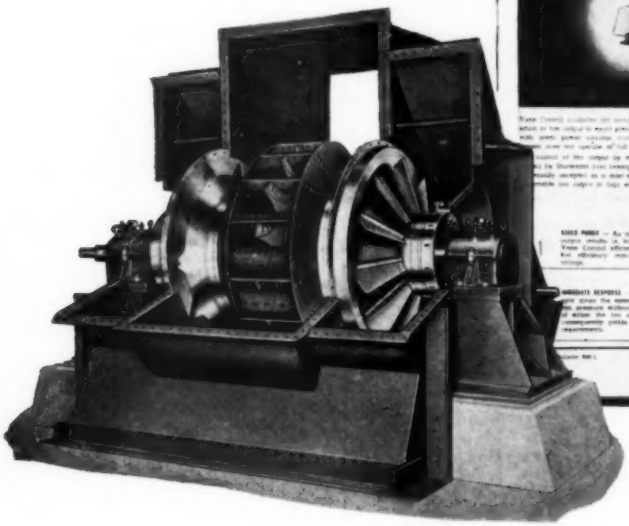
| Property | Units | ASTM Tests |
|---|---|---|
| Tensile strength 77 F, psi | 1,500-2,500 | D638-46T |
| Elongation 77 F, % | 100-200 | D638-46T |
| Flexural strength 77 F, psi | did not break | D790-45T |
| Stiffness 77 F, psi | 60,000 | D790-45T |
| Impact strength, Izod —78 F, ft lb/in. | 2.0 | D256-47T |
| 77 F | 4.0 | D256-47T |
| 170 F | 6.0 | D256-47T |
| Compressive stress at 0.1% deformation, psi | 1,700 | D695-44T |
| Coefficient of linear thermal expansion per deg F, 77 to 140 F | $5.5 \times 10^{-5}$ | D696-44 |
| Thermal conductivity 0.18 in., Btu/hr/sq ft/F/in. | 1.7 | (1) |
| Specific heat, Btu/ lb/ F | 0.25 | — |
| Deformation under load 122 F, 1200 psi, 85 hr, % | 4-8 | D621-48T |
| Heat-distortion temperature, 66 psi, per deg F | 270 | D648B-45T |
| Dielectric strength, short time, 0.080 in., volts/mil | 400-500(2) | D149-44 |
| Surface arc-resistance, sec. | 700(3) | D495-42 |
| Volume resistivity, ohm-cm. | $> 10^{18}$ | D257-46 |
| Surface resistivity, 100% R.H., megohms | $3.6 \times 10^{6}$ | D257-46 |
| Dielectric constant, 60 cycles | 2.0 | D150-47T |
| $10^{6}$ cycles | 2.0 | D150-47T |
| $10^{8}$ cycles | 2.0 | D150-47T |
| $10^{9}$ cycles | 2.0 | D150-47T |
| Power factor, 60 cycles | < 0.0005 | D150-47T |
| $10^{6}$ cycles | < 0.0005 | D150-47T |
| $10^{8}$ cycles | < 0.0005 | D150-47T |
| $10^{9}$ cycles | < 0.0005 | D150-47T |
| Water absorption, % | 0 | D570-42 |
| Flammability, in./min. | nonflammable | D635-44 |
| Specific gravity | 2.1 to 2.3 | D792-48T |
| Resistance to weathering | excellent(4) | — |
| Maximum service temp, F | 500 | — |

(1) Thermal conductivity measured by Cenco-Fitch apparatus.
(2) Value is 1,000-2,000 volts per mil, in thicknesses of 5 to 12 mils.
(3) Does not track.
(4) No detectable change after five years of outdoor exposure in Florida.

# A NEW CATALOG...

# ON POWER-SAVING

# VANE CONTROL®



Cutaway of a Sturtevant Induced Draft Fan shows VANE CONTROL and the E-R (Erosion Resisting) Wheel.

Just off the press, Descriptive Bulletin DB 92-810 gives you complete information and data on the *new* Sturtevant Adjustable Inlet VANE CONTROL.

This power-saving control has been universally accepted as the economical way to obtain variable fan output at high efficiency.

VANE CONTROL's new, easily operable link and lever system is completely outside the gas stream on Induced Draft fans. No abrasive dust ever reaches the operating mechanism.

Sturtevant VANE CONTROL is available for use on Forced Draft fans, Induced Draft fans, Industrial fans, and Centrifugal Compressors. Write today for a free copy of DB 92-810. Address Westinghouse Electric Corporation Sturtevant Division, 145 Damon Street, Hyde Park, Boston 36, Mass.

YOU CAN BE SURE...IF IT'S **Westinghouse**

J-80218

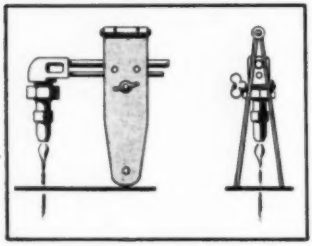
PUTTING *Air* TO WORK

# How to . . Shop Kinks and Hints . .

**What's your idea? Send it and a rough sketch to the How-to Editor.**
**We pay at least $10.00 for each item published.**

### Steady a Burning Torch

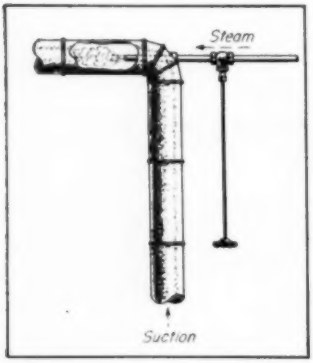
Here is how to improve and speed up production with a hand torch when welding or cutting long lines. Simply take a hinge, set it over the torch, as shown, and connect the legs with a



bolt and wing nut. The legs are then ground to a convenient length and rounded off. This holds the torch at a constant distance from the work, and makes it easy to handle and hold.

### Extinguish Exhaust Pipe Fires

In our plant we have a number of operations, which are connected into an exhaust system, such as wood sanding and metal buffing that produce inflammable dust. Under such conditions there is the possibility that fires will occur. To prevent a serious conflagration it is best to extinguish the fires as quickly as possible.




One method is to install a steam line in the exhaust pipe at the elbow nearest the point of operation. The stem of the valve is extended to bring the handwheel within easy reach of the operator. As soon as a fire is discovered, or suspected, the valve is opened wide, and the steam effectively smothers the flames.

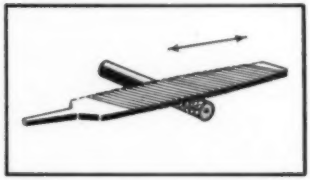
### Increase The Life Of Chucks

Frequently a drill press chuck will no longer properly clamp small drills. Here is an easy adapter, which will cor-

rect this situation. Take a piece of brass rod, drill a hole through it with the drill you intend to use. Slit the rod lengthwise through one side, as shown, to allow the adapter enough spring to grip the drill. This increases the life of worn chucks, and the rod may be used as a depth stop.

### Make a Press and Slide Fit

Once in a while it is necessary to make a dowel pin, which is a press fit in one hole and a slide fit in another piece. The usual method is to drill both holes, ream them to size and make the pin a slide fit in both holes. One end of the pin is roughened by prick-



punching or flattened by hammering until it is a press fit to one of the pieces. Here is a quicker and easier way: lay the pin on a flat surface and roll a coarse mill-file on one end of the pin. This will produce a slight knurl, which will swell the diameter enough to make a press fit.

### Clean a Clogged File

An easy way to clean out clogged file teeth is to use a piece of heavy brass shim stock. Hold it vertically to the edge at a 90 deg angle to the lines of the teeth rows on the file. Pass it back and forth across the file. The file teeth will produce a saw-tooth edge on the file cleaner, and these brass teeth will reach down dislodging even stubborn cast-iron or brass filings.

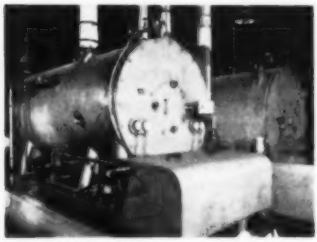
# Steam Generators Pay for Selves and Save $10,000 in First Year

## Operating Costs Reduced Sixty-Six % With Lower Fuel Cost & Maintenance

Many railroads have effected huge savings by replacing old inefficient boilers with modern packaged automatic steam generators. Mr. O. T. Carroll, Chief Engineer of Peoria & Pekin Union Railway Co., Peoria, Ill., purchased for his company two modern packaged steam generators; a 75 h.p. for stand-by and a 150 h.p. "on-the-line", and reports his savings as follows:

"The operation of the two York-Shipley Steam-Pak Generators installed in our roundhouse to furnish steam for heating the roundhouse and offices is beyond our expectations as to expense and efficiency.

The savings effected in changing from the operation of the old coal-fired boiler will pay for the cost of installation and the first year's operation."

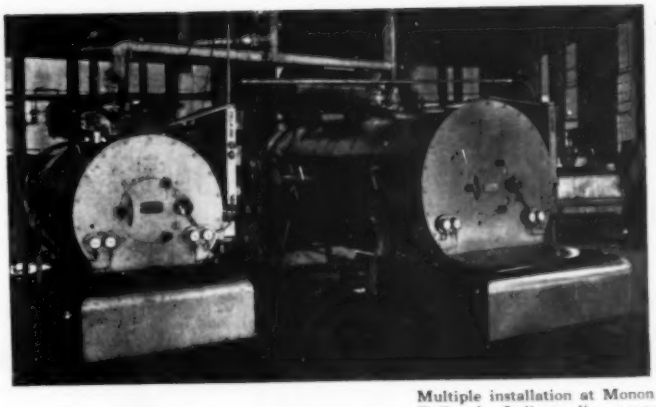


The total investment for these two new generators, fired with low cost Bunker C heavy fuel oil, was approximately $35,000. Cost of fuel and maintenance annually was reduced to approximately $8,000.00—a 66% reduction, based on the average operating cost of the old plant of $53,000.00 per year.

| | |
|---|---|
| Maintenance cost old boiler | $53,000. |
| Cost of new equipment | 35,000. |
| Operating cost new equipment | 8,000. |
| Total cost first year | $43,000. |
| First year's savings | $10,000. |
| Estimated 2nd year savings | $45,000. |

These modern Steam-Pak Generators, manufactured by York-Shipley, Inc., York, Pa., are showing similar savings in hundreds of installations all over the country.

*(Advertisement)*



Multiple installation at Monon Railroad, Indianapolis, saves $1,000.00 per month in fuel and labor.

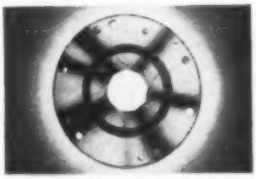
STEAM-PAK YORK POWER GENERATOR
A PRODUCT OF YORK-SHIPLEY

# SAVE MONEY

## They're Built For Maximum Efficiencies In Operation . . .

- Engineering design recognized by top engineers and architects.
- Satisfactory operation in thousands of buildings all over the country.
- Tremendous savings proven by hundreds of case histories.
- Distributors chosen for their engineering ability, trained to provide the best engineering "know-how."

These are four basic reasons why Steam-Pak should be No. 1 on your list of steam generators.
See your nearest York-Power Distributor or write York-Shipley for complete details.



**IRIS SHUTTER**
Patent protected feature provides precision control of burner air, accurately synchronizing air-oil adjustment.

**NEW FIRE CONTROL**
Swirling flame action speeds gas flow, increasing heat absorption and combustion efficiencies.

**Steam-Pak Generators — from 15 h.p. up, for low or high pressure steam or hot water, for light or heavy oil, combination gas and oil or straight gas.**

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Industrial Division

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*Pressure-Seal Bonnet Gate—available in 600, 900, and 1500 pound classes*

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**NO BONNET JOINT LEAKAGE . . .**
**NO BONNET JOINT MAINTENANCE**

Big maintenance savings can be made on high-pressure/high-temperature piping services by using Crane Pressure-Seal Bonnet valves in place of bolted bonnet valves. Once installed, these valves rarely need maintenance of the bonnet joint—line pressure keeps it leak-tight.

Lighter weight and more compact dimensions make savings in piping erection and suspension. Streamlined body design reduces insulating costs.

Other outstanding and typical features of Crane Pressure-Seal Bonnet Joint design are tailored-to-the-service alloy steels, Stellite trim, deep stuffing box, and flexible wedge disc in larger gates. In gates, globes, angles, or stop-checks, these valves are an investment in better piping performance at lower ultimate cost.

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# HEAT LOSS FROM BARE PIPE TO STILL AIR

JOSEPH T. HOGAN, *Chemical Engineer*

CALCULATION of heat loss by natural convection and radiation from single horizontal bare pipe to still air enters into many engineering-design computations. These heat-loss data are essential for the estimation of Btu saving due to insulation and the efficiency of insulation.

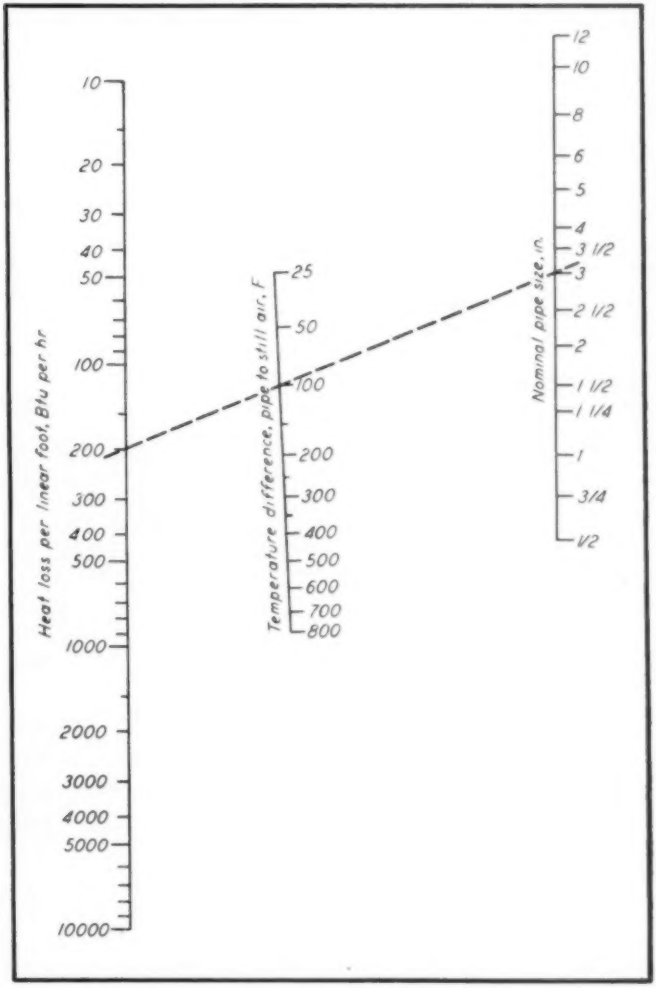
The experimental data of Heilman and McMillan (Reference 1) can be converted to simple nomographic presentation for the solution of heat-loss calculations.

Use of the nomograph requires a knowledge of the pipe size and the temperature difference between pipe and surrounding air. A straight line connecting known values of these two factors gives the heat loss in Btu per hour per linear foot of pipe. Heat loss depends upon the external diameter of the pipe, and the values of the pipe sizes shown apply to standard, extra-strong and double-extra-strong pipe, since outside diameters are the same.

Heat loss given by the nomograph may be converted to Btu per hour per square foot of pipe surface by dividing the nomograph value by the external surface area per foot of length. These areas are given in pipe tables.

EXAMPLE: *Determine the heat loss from one linear foot of 3-in. pipe at 180 F to still air at 80 F.*

SOLUTION: Temperature difference is 180—80=100 F. A straight line connecting 3 on the nominal-pipe scale and 100 on the temperature-difference scale intersects the heat-loss scale at 200. From pipe tables, one linear foot of 3-in. pipe has external area of 0.916 square feet. Loss of heat per square foot of pipe surface is 200/0.916=218 Btu per hour.




REFERENCE (1) Perry, J. H., Chemical Engineers' Handbook, McGraw-Hill Book Co., Inc. New York.

# FRICTION LOSS IN DUCTS

**JOHN D. CONSTANCE, *Professional Engineer***

IN AIR-DUCT design, friction-loss data on duct fittings and connections are most useful especially if evaluated and compared on a single chart shown below. Although not all the variations in shape and size are shown, the more common ones are included. The values shown are good practical ones, and have been in use for a long time in both industrial and commercial design. These losses due to internal friction of the fluid and sidewall friction are expressed in terms of velocity head.

One velocity head is given by:

$$h_v = \frac{\text{duct velocity}^2}{4005^2} \text{ in inches of water.}$$

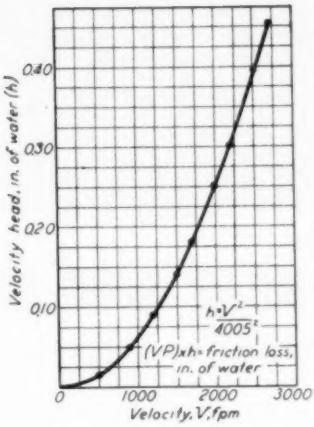
This velocity head may often be called velocity pressure, *VP*. For example, in case No. 1 on the chart for a sharp elbow where R/W=O, the loss is 1.25 velocity pressure. If the duct velocity should be 2,000 fpm, the velocity pressure is

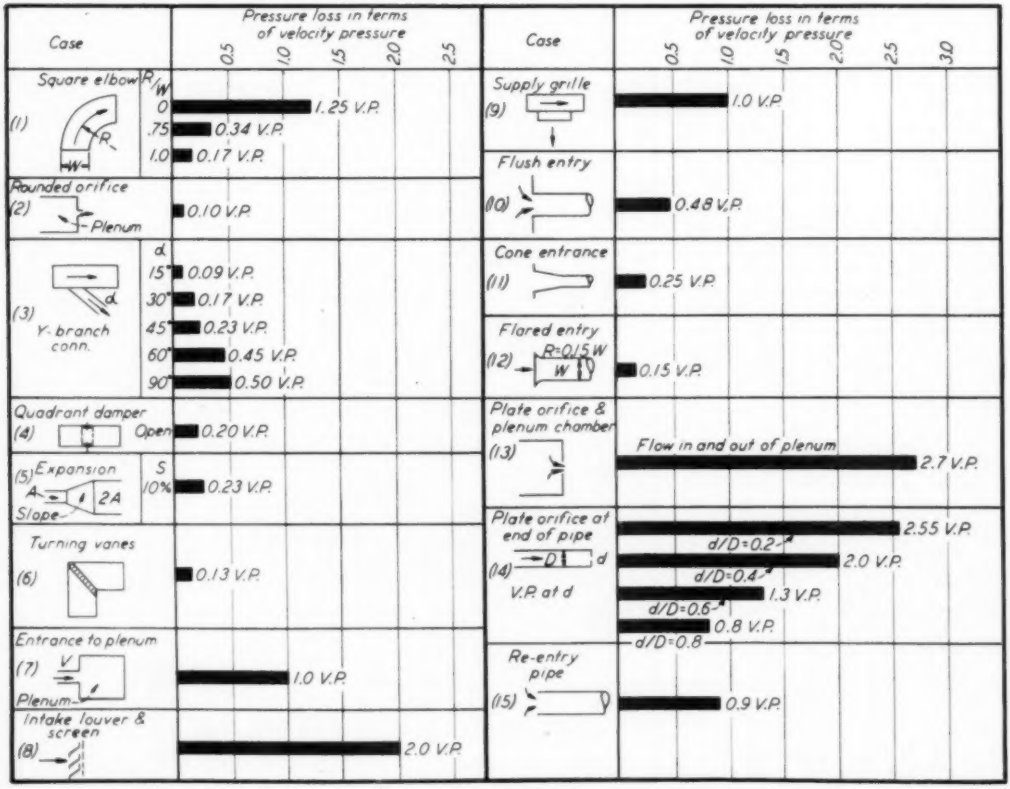
$$h_v = \frac{2{,}000^2}{4005^2} = 0.25 \text{ in. of water.}$$

Loss through the elbow would then be 0.25 x 1.25=0.31 in. of water. To this must be added duct losses, all expressed in the dimension inches of water when developing the loss in a duct system.

To save computing time, the curve at the right may be used with apparent facility. Here velocity is plotted against head and all that is required is to move upward from the abscissa to the curve, and then to the left to read velocity head.

Apparent inconsistencies in various published data may be the result of variations in velocity contours, apparatus setup, evaluation of data, refinements in testing technique, air density and ratio of duct width to depth (aspect ratio).





Case
Pressure loss in terms of velocity pressure
0.5
1.0
1.5
2.0
2.5
Square elbow (1) R/W 0 1.25 V.P. .75 0.34 V.P. 1.0 0.17 V.P.
Rounded orifice (2) Plenum 0.10 V.P.
Y-branch conn. (3) α 15° 0.09 V.P. 30° 0.17 V.P. 45° 0.23 V.P. 60° 0.45 V.P. 90° 0.50 V.P.
Quadrant damper (4) Open 0.20 V.P.
Expansion (5) A 1 2A Slope S 10% 0.23 V.P.
Turning vanes (6) 0.13 V.P.
Entrance to plenum (7) V Plenum 1.0 V.P.
Intake louver & screen (8) 2.0 V.P.
Case
Pressure loss in terms of velocity pressure
0.5
1.0
1.5
2.0
2.5
3.0
Supply grille (9) 1.0 V.P.
Flush entry (10) 0.48 V.P.
Cone entrance (11) 0.25 V.P.
Flared entry (12) R=0.15 W W 0.15 V.P.
Plate orifice & plenum chamber (13) Flow in and out of plenum 2.7 V.P.
Plate orifice at end of pipe (14) D d V.P. at d 2.55 V.P. d/D=0.2 2.0 V.P. d/D=0.4 1.3 V.P. d/D=0.6 0.8 V.P. d/D=0.8
Re-entry pipe (15) 0.9 V.P.

C ONSERVATION
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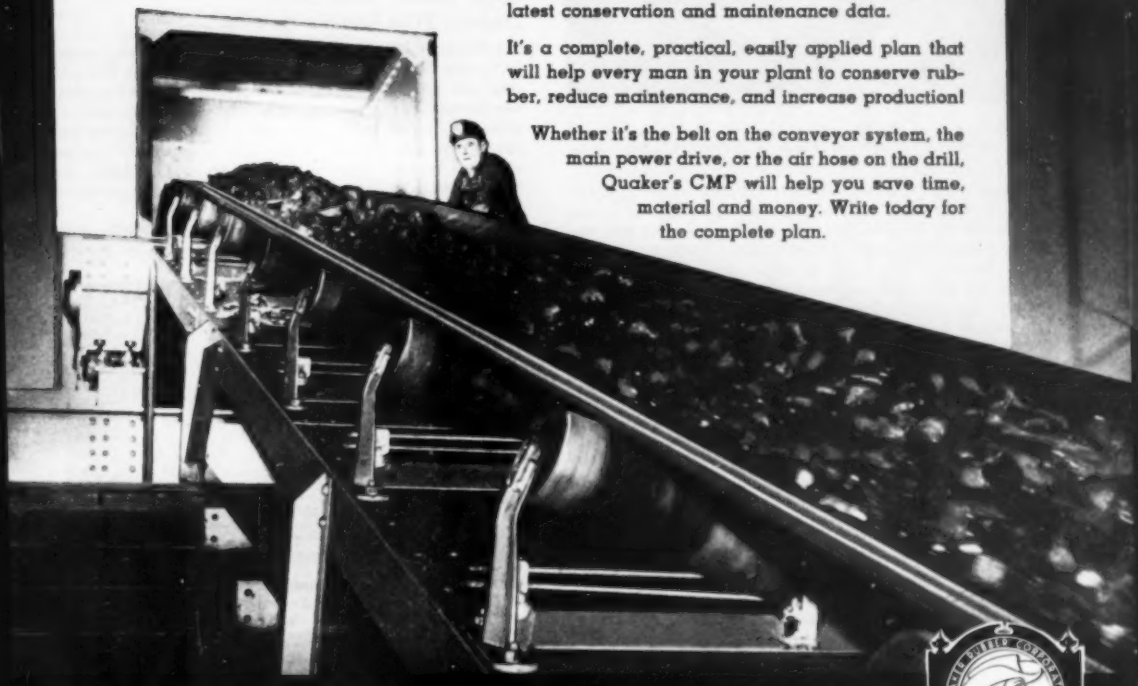
Developed by the Quaker staff, CMP includes a big factual booklet on how to make conveyor and transmission belting, hose, and packings last longer. Charts are available for shop bulletin boards. Technical bulletins will be issued periodically with the latest conservation and maintenance data.

It's a complete, practical, easily applied plan that will help every man in your plant to conserve rubber, reduce maintenance, and increase production!

Whether it's the belt on the conveyor system, the main power drive, or the air hose on the drill, Quaker's CMP will help you save time, material and money. Write today for the complete plan.



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# Spot News

**Short, "boiled-down" paragraphs on the most interesting recent events and developments in American industrial plants.**

## Daily Capacity of Water-Supply Line Increased 20,000,000 Gal By Booster Pump

A daily increase of 20,000,000 gal of water has been made possible through the use of an electrically driven booster pump at Phoenix, Ariz. A booster station uses an 800-hp General Electric motor to drive the pump. A 5-hp G-E motor operates a valve that connects the pump to a 48-in. main.

***Motor rated at 800-hp drives new pump at booster station in water line from Verde River to Phoenix, Ariz.***

Cost of the city's installation is about $70,000—a fraction of the estimated $400,000 cost of a new pipeline with the same capacity, according to R. Gail Baker, Phoenix city engineer. Because of the large increase in the number of water customers during the past year, the booster station was needed to step up the city's daily capacity of water lines from Phoenix supply source in the Verde River.

The pump has a peak capacity of 50,000 gpm or 72,000,000 gpd. The pipeline's capacity could be increased only by 20,000,000 gpd.

## ASA Revises Standards for Electrical Indicating Instruments

First specifications for portable and laboratory indicating instruments have been approved by the American Standards Association in a revision of the American Standard for Electrical Indicating Instruments.

These instruments can now be checked and the performance expected can be determined from the listed characteristics and limits of the accuracy class for any particular requirement.

This new edition covers alternating and direct current instruments — ammeters, voltmeters, single phase and polyphase wattmeters, power factor meters, varmeters and frequency meters.

For the first time in this standard a new "influence" appears. This is the sustained operation influence defined as the change caused by energizing instruments over extended period of time above the indications when first connected to the circuit. Values are assigned for this influence and given in the charts on detailed requirements.

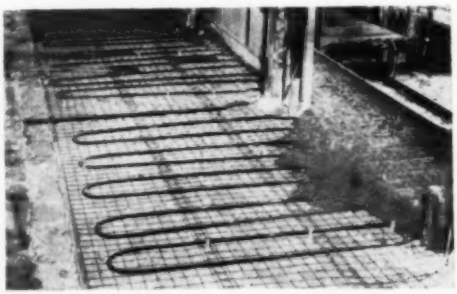
These charts, tabulated for easy reference, cover 33 types of panel, switchboard and portable equipment. They include: rated accuracy, position influence, external temperature influence, sustained operation influence (maximum), external field influence (maximum) and magnetic platform effect (maximum).

Copies of the American Standard for Electrical Indicating Instruments, C39.1-1951, may be obtained from the American Standards Association, 70 East 45th Street, New York 17, N. Y., at $1.60 per copy.

## Sugar Refiner Solves Sticky Problem With Radiant Heating

Officials of a modern cane sugar refinery had been plagued for a long time by the presence of moisture on the floors of their raw sugar warehouses at a deep-water port where relative humidities range quite high. These floors consisted of concrete covered with ¼-in. steel plates. Cold-weather "sweating", particularly after a warm humid night, created a hazard because of the inevitable spilling of sugar, the small particles adhering and making the area dangerous to work in.

Engineers decided the job couldn't be tackled by half-hearted measures. They ripped up the old floor, installed radiant heating coils of 1-in. Byers wrought iron pipe, and laid a new floor over them. The system was extended to cover all runways from the wharf to the manufacturing area.



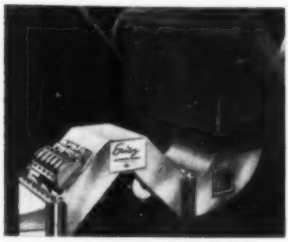
***Radiant heat stops condensation on sugar refinery floors to eliminate sticky surfaces that were safety hazards***

The installation, which is regulated to keep the floor slab at a temperature 5 to 8 F warmer than that outside, has

completely eliminated condensation moisture. Recently the entire refined sugar shipping department got a similar treatment, which includes all storage and operational areas as well as shipping platforms.

## Fire Hazard Reduced With Permanent-Magnet Separators

The Appleton Co., Anderson, S. C., one of the country's largest producers of cotton flannels, uses an Eriez magnetic Hump separator for protection from fire and machinery damage. As illustrated, the unit is installed between the bale breaker and vertical opener. It catches clips, nails, bolts, and other metal impurities which, if not taken out, might



***Used in ducts that handle cotton fibers, magnetic separators remove tramp iron; result, no sparks and no fires***

cause machinery damage or strike a spark and start a fire. Appleton reports that it has had no opening room fires since the equipment was installed. Consisting of two permanently magnetized Alnico magnets inserted in a rectangular sheet-metal housing, the Eriez Hump is completely non-electric in operation and may be used in pressure-tight or liquid-tight lines. The separator is designed on the flow-interrupting principle. As the material being cleaned changes direction, because of the hump shape of the unit, a tumbling or mixing action is brought about. This breaks up the flow of material and gives one of the two magnets an opportunity to remove the tramp iron.

## Recovery of Waste Heat Means Savings in Fuel Costs

Every gallon of hot waste water pouring down the drain represents a loss of fuel or energy.

Where the temperature differential is great, recovery is easy with present-day heat exchangers. However, when the difference is small, the problem of recovery is very great and remains to be economically solved.

Take for example a laundry: for every 10 gal of 160 F wash water pouring into the sewer, about one pound of coal or ¾ of a pint of fuel oil was needed to obtain such a temperature. Plants running a large volume of water each month can show sizable savings through the use of waste heat reclaimers-heat exchangers. Not only can heat be recovered from the wash water, in this case, but also from the rinse.

Another interesting example of how engineers have recovered heat to effect large savings is seen in a paper mill digester. Since this operation is done at high temperatures in sealed units under pressure, flash steam is released when the unit is opened after completion of the process. This steam is passed through a tube and shall exchanger and the transferred heat is used to preheat fresh water.

Other industries now utilizing waste heat in processes or from waste water include: textile mills, power plants, refineries, and chemical processing. Some concerns have also used the heat from diesel engine exhaust to preheat water

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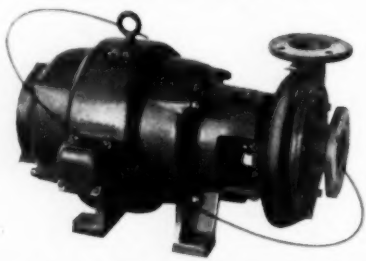
This man . . . symbolic of the entire WEINMAN organization . . . has the latest pumping information at his fingertips. He can look at your present liquid handling equipment and tell you whether it is making you . . . or costing you . . . CASH DOLLARS. Professionally he lives alone . . . with centrifugal pumps . . . and likes it. For pumps, the ONLY product made by WEINMAN, constitute a challenge that has kept every key man and department head completely absorbed for the past tweny-five years.

There's a WEINMAN design that best does your pumping job. YOU and your WEINMAN representative should establish this important production link at the earliest opportunity. Together you can put all of your pumping operations on a paying basis. Write, wire or 'phone.

GENERAL SERVICE UNIPUMP



*Because of its compact design the WEINMAN Unipump is extremely useful where installation space is limited. It is sturdily built and works against heads up to 500 feet at economical cost. Sizes up to 1000 G.P.M.*

*Built by Centrifugal Specialists*

The WEINMAN Pump Mfg. Co

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or to heat a plant. Mills have utilized the hot water produced in quenching tanks for heating.

Coils in open-type exchangers, and tubes in the closed type, are either of copper or a copper-base alloy depending on the waste media involved. In many cases, Duplex tubes are required when two different corrosive liquids are involved. Combinations of Admiralty, aluminum brass, copper, cupro nickel, aluminum bronze, Muntz metal, yellow brass, Naval brass, silicon bronzes, aluminum, lead, nickel, low carbon steel, stainless steel, alloy steels and tin are possible in Duplex tubes. —Courtesy Bridgeport Brass Co.

## Silicone Resin Base Paint Retards Moisture and Checking

Because of its unique properties—technical men in the paint, varnish and lacquer industry as well as those manufacturers who use protective coatings—should become better acquainted with silicone resins and oils, according to J. W. Raynolds, assistant manager of the Chemicals Div. of General Electric's Chemical Dept. in a recent address before the National Paint, Varnish, and Lacquer Association.

There are an infinite number of molecular combinations, which will produce silicone resins for coating applications, Mr. Raynolds stated. To date only a tiny fraction of the possible have been produced commercially. Among these is G-E 81182 silicone resin that will increase resistance to gasoline, oil, grease, stains, heat and moisture.

In combination with alkyd resins, silicone resin has indicated some very interesting moisture-retarding possibilities. Stucco panels that were treated, either as a primer under cement paint or as a clear finish coat, retard the formation of surface checking. Test panels subjected to two months of summer sun and weather showed no indication of checking.

Silicone anti-foam agents are being widely used to reduce foaming in varnish kettles, Mr. Raynolds added. Silicone anti-flooding agents are even more widely used to reduce or eliminate orange peel, "silking" and pigment flooding.

In closing, Mr. Raynolds expressed the belief that the coatings industry will quickly sense the sales possibilities available to those manufacturers who are able successfully to formulate with silicone resins and oils.

## Gas Turbine Generator of 15,000 Kw Rating Is Ordered By Midwest Utility

Largest gas turbine generator yet ordered for commercial generation of electric power was announced recently by Westinghouse Electric Corp. The unit, a 15,000 kw machine, will be installed in the Bartlesville area of the Public Service Company of Oklahoma.

Natural gas from the Oklahoma fields will provide the heat energy that the new turbine will convert into electric power. The gas turbine will comprise high and low pressure turbine driving high and low pressure compressors, respectively, with the high pressure turbine also connected to drive the generator.

The turbines will operate at a temperature of 1350 F. Turbine speed will be 3600 rpm. At full load, the compressors will draw in 7½ ton of air per minute.

The high-temperature power plant is an outgrowth of 12 years of research and development that has also led to design of the world's most powerful turbojet aircraft engine and to construction of a gas-turbine locomotive now on rail test. Experimental industrial gas turbines designed and built by Westinghouse have been under operation and study at test plants, and have been in commercial service for several years.

# BIRD-ARCHER'S COMPREHENSIVE 8 POINT WATER TREATMENT SERVICE

Even if your present water treatment methods **appear** satisfactory, it will pay you to look into Bird-Archer's 8-point water treatment service. Any or all of this comprehensive, efficient service is available to you. Talk to your Bird-Archer representative about it next time he calls. Or, write us now to arrange a consultation. No obligation, of course.

## *What Bird-Archer Does*

**1. Surveys Plant**—Bird-Archer makes a complete study of plant operation involving the use of water or steam . . . checks present equipment and past performance.

**2. Studies All Available Water** — Starting at the source, Bird-Archer makes exhaustive analyses of water supplies.

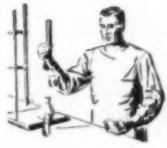
**3. Develops Treatment and Control Systems**—On the basis of these comprehensive studies, Bird-Archer develops a complete system of treatment and control, including necessary operational changes.

**4. Specifies Equipment that May Be Necessary** — Bird-Archer determines whether installation of additional equipment will be helpful . . . analyzes benefits to be derived.

**5. Furnishes Proper Chemical Treatments When Required**—For more than a half century, Bird-Archer has manufactured specifically formulated treatments to solve individual problems.

**6. Instructs Plant Staff**—Plant personnel is carefully instructed by experienced technicians in the application of treatment and control . . . teaches simple, accurate test procedures.

**7. Makes Periodic Check-Ups** —To make certain that the recommended system is providing the best possible results, a Bird-Archer Service Engineer makes regular, personal check-ups.



**8. Offers a Laboratory Service for Scientific Analysis**—Modern Bird-Archer laboratories, staffed by trained chemists, specialize in water analyses and research . . . check accuracy of plant control.

# BIRD-ARCHER
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# NEWS . . . of men and companies

## AWARDS

**American Institute of Electrical Engineers**—The 1950 Benjamin G. Lamme gold medal was awarded Donald I. Bohn, chief engineer of the Aluminum Co. of America, for "his pioneering development and application of electrical equipment for controlling rectifying systems in the production of aluminum."

**American Standards Assoc.**—A certificate of cooperation was presented by the Economic Cooperation Administration for helping technical missions from overseas study U. S. standardization and simplification practices.

## NEW REPRESENTATIVES

**Elgin Softener Corp.**—Betz Engineering Sales Co., 1225 S. Magazine St., New Orleans, will handle the complete line of water conditioning products in the New Orleans territory.

**Nordberg Manufacturing Co.**—Yaun Equipment Co., 2120 N. Third St., Baton Rouge, La., is distributor for 4FS diesel engines in southern half of state.

**Warren Steam Pump Co., Inc.**—Betz Engineering Sales Co., 1225 Magazine St., New Orleans, La., will cover the New Orleans territory. Harry W. Faunt Le Roy & Associates, Standard Oil Bldg., Baltimore have been named agents in the Baltimore area.

**Owens-Illinois Glass Co.**—Luse-Stevenson Co. is distributor-applicator for Kaylo heat insulation in the Chicago area.

## SALES OFFICES

**Binks Manufacturing Co.**—A new office is located at 22-01 41st Ave., Long Island City 1, N. Y.

**Cutler-Hammer, Inc.**—Sales office at 120 East Third St., Charlotte, N. C. is being opened.

**The Foxboro Co.**—New branch office is open at 618 W. Church Ave., Knoxville 16, Tenn. M. L. Cleaton, Jr., is branch manager.

**Goodyear Tire & Rubber Co.**—District office with R. E. Workman as manager is established in St. Louis by the chemical div.

**Sylvania Electric Products Inc.**—The lighting sales department has organized a new division office and warehouse operation in Dallas.

### MOTOR COURSE HELPS FILL LACK OF TRAINED MEN

*Showing the latest ideas and methods that industry is using in the application of motor power, here is a program designed to assist in filling the need for trained men in the present emergency. It is fifteenth in the General Electric Co. "More Power to America" series.*

*The program consists of nine 35-mm slide-films, students' review booklets and an instructor's manual. With a 15 to 30 min running time, each film is accompanied by a sound recording. The course, available at nominal cost through the company's district offices, is prepared so that any competent engineer can teach it.*

*Selection of the right motor for any job is necessary and desirable to conserve materials. Specifically, the course instructs by showing how motors operate, what types are available, and how to select and apply them. The first three films are on fundamentals to establish a "common language"; the rest are on a more technical level.*

## EXPANSIONS

**Corning Glass Works**—Construction of a new glass plant in Danville, Ky., for manufacture of glass bulbs and tubing is announced. It will have a floor area of 270,000 sq ft.

*( Continued on page 110 )*

***At the Diesel Engine Manufacturers Association annual meeting of advertising managers, sales promotion managers and public relations directors at the Union League Club of Chicago, problems pertaining to the respective fields of the executives were discussed. Among those present were, standing, left to right: J. D. Grace, manager advertising and public relations of Nordberg Mfg. Co.; Don House, advertising agency for Nordberg; F. A. Uniack, director of public relations for Cleveland Diesel Engine Div. of General Motors Corp.; V. B. Fowler, in charge of adertising for Electro-motive Div. of General Motors; E. W. Manterfield, director of public relations, American Locomotive Co.; W. P. Durbin, ass't advertising manager, Electro-Motive Div. of General Motors; James Love, Leo Burnett Advertising Agency; A. L. Decker, v-p of Buchen Co.; R. S. Ogg, ass't sales manager, Lima-Hamilton Div. of The Baldwin-Lima-Hamilton Corp.; George Frye, agency for Worthington Pump & Machinery Corp.; H. P. Sharp, manager sales development at Cummins Engine Co., Inc.; A. P. Colby, advertising manager of The National Supply Co.; W. R. Miner, Cummins Engine Co., Inc.; Gene Bonnist, advertising director of Cooper-Bessemer Corp.; and R. P. March, manager advertising dep't of Worthington Pump & Machinery Corp. Sitting, left to right, are: Joseph Kenny, advertising dep't of Nordberg; H. H. Kohenour, manager advertising at The Buda Co.; J. R. Roberts, charge of sales promotion in diesel section, International Harvester Co.; W. H. Kuhlman, supervisor of sales promotion at International; H. J. Barbour (chairman of the meeting), manager sales promotion for Fairbanks, Morse & Co.; G. B. Cushing, manager sales promotion of The National Supply Co.; L. A. Harlow, manager of advertising at Fairbanks, Morse & Co.; Marty D'Amico, advertising dep't, The National Supply Co.; and H. T. Hill, executive director, Diesel Engine Manufacturers Association***

# OPERATION: FLEXIBILITY

## A CLEAVER-BROOKS STEAM BOILER GIVES YOU:

✓ **Quick, effortless response to fluctuating steam demands.**

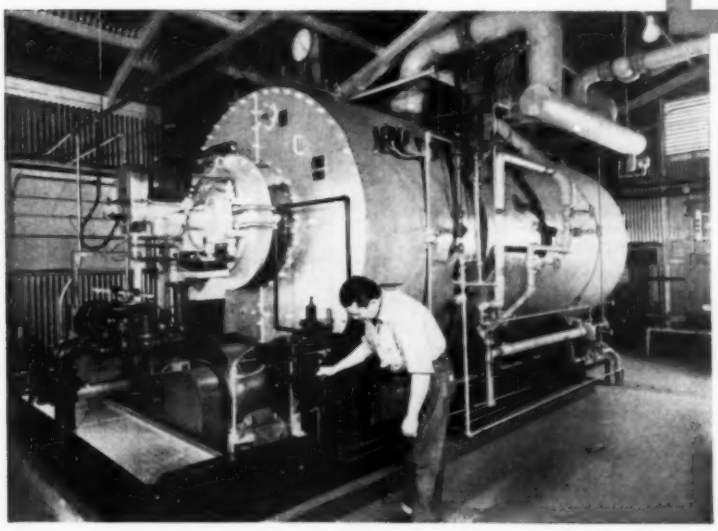
✓ **Equally high efficiency (80%) operating with oil or gas.**

Fluctuating steam loads are no problem when you have a custom-planned Cleaver-Brooks boiler in your plant. Whether your demand is heavy or light, steady or variable, these sturdy heavy-duty boilers respond instantly to your steam needs. Even with loads as low as 30% of rating, Cleaver-Brooks boilers operate with a flat 80% efficiency.

Cleaver-Brooks boilers burn either oil or gas . . . either fuel is properly proportioned to meet your steam demand and need. No banking of fires or loss of valuable heat during low load periods. You benefit with lower fuel bills, less maintenance, reduced operating costs.

If you are considering a change in your present boiler plant—think about flexibility — and get the complete facts about Cleaver-Brooks custom-planned boilers. Cleaver-Brooks self-contained boilers 15 to 500 HP, 15 to 250 lbs., p. s. i. — oil, gas, combination oil and gas firing. CLEAVER-BROOKS COMPANY, 835 East Keefe Avenue, Milwaukee 12, Wisconsin.

**Cleaver-Brooks**
STEAM BOILERS
*the first and finest of their class*



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# COLLECTS MORE DUST

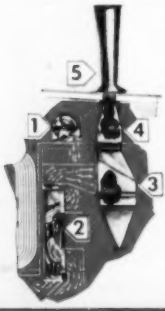
## in the *ultra-fine* particle

VALMONT TYPE S

With Prat-Daniel Dust Collectors, an extremely high percentage of the ultra-fine particles are removed from the gas stream. Long, narrow inlets on tubes of small diameter produce high efficiency even at reduced loads. The low velocity reduces erosion and combined with wear-resistant steel construction gives P-D collectors the desired combination of high efficiency and exceptionally long life.

All types of P-D Collectors meet the requirements of most dust ordinances; the high efficiency of the Valmont Type S, however, exceeds the requirements of many of the most stringent ordinances.

"Uni-block" construction, with complete tube sections assembled at the factory, makes relatively low installation costs possible. Hundreds of installations have proved P-D Collectors' all-'round efficiency and low maintenance costs provide a high return on investment. Get the best in dust collectors for your plant. Write our Sales and Project Engineers for Catalog No. 250S.




**UNIT RESPONSIBILITY**

Prat-Daniel, through its sales and project engineers, The Thermix Corp., offer a complete complement for handling the air gas stream shown at left: 1. Forced Draft Fans, 2. Air Preheaters, 3. Tubular Dust Collectors, 4. Induced Draft Fans and 5. Fan Stacks. This unit responsibility, by a well-known firm, relieves the engineer of the responsibility for one of the most important functions in a steam generating plant.

*Sales and Project Engineers*

**THE THERMIX CORPORATION**

GREENWICH, CONN.

*Canadian Affiliates:* T. C. CHOWN, LTD.
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*Designers and Manufacturers*

**PRAT-DANIEL CORPORATION**

SOUTH NORWALK, CONN.


## EXPANSIONS

*( Continued from page 108 )*

**Dearborn Chemical Co.**—New offices on the third floor of the Chicago Merchandise Mart have been acquired.

**DeLuxe Products Corp.**—New oil filter and industrial sales div. for gasoline and diesel engine oil filters will be headed by J. F. Austin.

**E. I. DuPont de Nemours & Co., Inc.**—Construction on a plant to manufacture "Dacron", originally known as "Amilar", is expected to start this spring on the Neuse River near Kinston, N. C. Plans for expansion of facilities for "Ponsol" dyes at Deepwater Point, N. J. have been announced. It involves approximately one million dollars, with initial production scheduled for early 1952.

**Johns-Manville Corp.**—Construction of a large research building is planned as an addition to the J-M Research Center group near Manville, N. J. Turner Construction Co. will erect the 574x136 ft building.

**Monsanto Chemical Co.** — Negotiation for the purchase of a 115 acre site and several buildings in Addyston, Ohio for production and distribution of plastics is in progress. It is another unit in Monsanto's $22,000,000 plastics expansion program.

**Rockwell Manufacturing Co.**—A separate division to fabricate armor plate will operate as the Freeport (Ill.) Div. New general manager will be C. C. Shenkle.

**Westinghouse Electric Corp.**—Purchase of 3½ acres in Farmers Branch, Texas, near Dallas, for construction of a warehouse has been announced. It will provide 29,000 sq ft of floor area.

**Worthington Pump & Machinery Corp.**—Ground has been broken at Succasunna, N. J., for a vertical turbine pump plant. A one-story building, measuring 80x200 ft will be constructed by the Lawrence Construction Co. R. C. Tierney will be in charge.

## APPOINTMENTS

**The American Water Softener Co.**—A. E. Kittredge directs a new division to develop a deaeration process. He was v-p and chief engineer of Cochrane Corp.

**O. M. Riggs** **A. E. Kittredge**

**The Hays Corp.**—O. M. Riggs was made manager of application engineering. He was chief project engineer in the sales department.

**Allegheny Ludlum Steel Corp.**—R. T. Eakin is made manager of the company's Brackenridge, Pa., plant, succeeding George Evans.

**American Society of Heating and Ventilating Engineers**—I. W. Cotton, president of I. W. Cotton Co., Inc. is appointed chairman of the committee on research.

**Arcos Corp.**—J. R. Collins has been transferred to the newly opened welding electrode sales office located in Chicago and serving that territory.

**Byron Jackson Co.**—Carl Blom, chief engineer, pump division is elected v-p.

**Cutler-Hammer, Inc.**—O. P. Proudfoot has been named manager of the Cleveland district sales office succeeding R. J. Eckstein, who died Feb. 14.

**Davey Compressor Co.**—E. A. Utecht is made ass't chief engineer.

C. B. Schmidt G. W. Smith

**De Laval Separator Co.**—C. B. Schmidt is elected president. He has been with the company 29 yr. Retiring president G. C. Stoddard continues in an executive advisory capacity. G. W. Smith, elected chairman, is also president of De Laval Steam Turbine Co.

**Dewalt Inc.**—W. H. Roesing is the new district sales manager for parts of New York, New Jersey and Connecticut.

**Dow Chemical Co.**—W. R. Dixon is named ass't general sales manager. He succeeds Dr. L. S. Roehm, who has accepted an executive position with the A. E. Staley Mfg. Co. J. C. Van Horn is ass't manager of the technical service and development div.

**General Electric Co.**—F. J. Van Poppelen is named general manager of the air conditioning department with headquarters at Bloomfield. E. F. Paul was made manager of manufacturing of the specialty transformer and ballast divs. at Fort Wayne, replacing W. F. Oswalt, who has a new position in the control divs. He is succeeded by Donald Poland as manager of the Danville (Ill.) plant.

C. L. Ipsen, manager of the industrial heating divs. accepts an advisory position in the machinery div. of the NPA. In his absence E. W. Cunningham is named acting manager.

**Golden-Anderson Valve Specialty Co.**—G. A. Colton formerly v-p and general manager was elected president.

**Goodyear Tire and Rubber Co.**—C. O. McNeer was named sales manager for the chemical div.

*( Continued on page 112 )*


Where You'll Find Proof Of The Experience Behind . . .

BOILERS BY BIGELOW

**Some Typical Installations of Boilers By Bigelow**

**PETER PAUL, INC.,** Naugatuck, Conn.
8,000 lb. per hour . . . oil fired

**HOTEL DENNIS,** Atlantic City, N. J.
14,000 lb. per hour . . . oil fired

**GALLO WINERY,** Modesto, Calif.
26,000 lb. per hour . . . oil and gas fired

**AURORA GASOLINE,** Detroit, Mich.
35,000 lb. per hour . . . oil fired

**THE STANLEY WORKS,** New Britain, Conn.
50,000 lb. per hour . . . oil fired

**BARTGIS BROTHERS,** Ilchester, Md.
60,000 lb. per hour . . . coal fired

**ST. MARY'S SUGAR,** Sorel, La.
45,000 lb. per hour . . . Bagasse

**INTERNATIONAL SILVER CO.,** Wallingford, Conn.
30,000 lb. per hour . . . oil fired

**BEST FOODS,** San Francisco, Calif.
40,000 lb. per hour . . . oil and gas fired

**Throughout industry, Bigelow boilers are piling up service records of efficient steam production. Each successful installation is further evidence of Bigelow's boiler-making experience. Each is operating proof of Bigelow's ability to build boilers to answer a wide range of steam requirements.**

**Every one of the hundreds of Bigelow boilers holding down vital power jobs is another reason for you to consider Boilers By Bigelow for your plant.**

**Write for free catalogs on any of the units listed here.**

BOILERS BY BIGELOW
Water Tube Boilers — Bent Tube Types
Horizontal Return Tubular Boilers
Scotch Type Boilers
Two-Pass Boilers
Electric Steam Generators

THE BIGELOW COMPANY • NEW HAVEN 3, CONN.
*Established 1833*

BIGELOW REPRESENTATIVES: Boston • New York • Philadelphia • Syracuse • Detroit • Chicago • Pittsburgh • Milwaukee • New Orleans • Baltimore • Petersburg, Va. • Washington, D. C. Albuquerque • Seattle • Sumter, S. C.

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Compute the cost of time wasted by executives and employees running back and forth. *That's how much* the NEW Executone Intercom can save you! Your voice—with lightning speed—gets information, gives instructions. Your employees accomplish more, too, with inter-departmental communication. "Inside calls" no longer tie up telephone lines. Office and plant operate at a new peak of efficiency!

**Years ahead of its time in operation and design!**

"CHIME-MATIC" Signalling announces calls with a soft chime and signal light, saves time on every call. New switching circuits for every need make new savings possible. Voices are clearer, distinct, instantly recognizable. Inexpensive 2 station system easily expanded. *See* it—no obligation. Just mail the coupon.

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*Without obligation, please let me have:*
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☐ Complete descriptive literature
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FIRM.....
ADDRESS..... CITY.....


## APPOINTMENTS

*( Continued from page 111 )*

**Ilg Electric Ventilating Co.**—R. I. Hanford is new head of the engineering department; L. E. Peterson, head of research div.; F. E. Drechsel, design div.; and J. O. O'Brien, information div.

**International Harvester Co.**—W. M. Holland, manager of manufacturer sales for the industrial power div., was elected president of the Internal Combustion Engine Institute.

**Jefferson Electric Co.**—J. D. O'Brien was appointed sales manager.

**Mine Safety Appliances Co. of Canada, Ltd.**—W. G. Claus has been appointed purchasing agent.

**Nordberg Manufacturing Co.**—P. S. Shirley is made chief development engineer, heavy machinery div.

**Pennsylania Flexible Metallic Tubing Co.**—Mrs. Eleanor E. Perks is made advertising manager and will direct advertising and public relations programs.

**Petro-Chem Development Co.**—E. J. Wasp is made chief process engineer of the sales div.

**Propeller Fan Manufacturers' Assoc.**—Officers elected at the annual meeting are: president, P. T. Finch, sales manager, Hunter Fan Ventilating Co.; vice-president, B. G. Krause, manager, Air Controls Inc.; and secretary-treasurer, L. O. Monroe, 2159 Guardian Bldg., Detroit.

Richard Moyer

F. B. Skeates

**Link-Belt Co.**—R. C. Becherer was elected v-p. All officers who served last year were re-elected. Richard Moyer has been appointed general manager of the north central div. with headquarters in Minneapolis. F. B. Skeates, personnel manager at the Pershing Road plant, Chicago, succeeds Moyer as general superintendent there.

**H. K. Porter Co., Inc.**—J. R. Lewis has been named ass't general sales manager of Quaker Rubber Corp.

**Raybestos-Manhattan, Inc.** — G. W. Marshall, Jr., was elected v-p and will direct sales activities at the Manheim, Pa., plant. A. F. Heinsohn was made v-p in charge of the General Asbestos and Rubber Div. at North Charleston, South Carolina.

**SKF Industries, Inc.** — Norman A. Strang is appointed advertising manager succeeding R. C. Byler, deceased. He has been with John Lucas & Co., Roberts & Manders Stove Co. and Sun Oil Co. in an advertising capacity.

**Sylvania Electric Products Inc.**—W. J. Rashleigh, P. T. Owens and Myles Gaythwaite are appointed sales managers of new divisions in Chicago, Milwaukee and St. Louis.

**Timken Roller Bearing Co.**—S. T. Salvage was appointed advertising manager and Paul Reeves, director of sales.

**Worthington Pump and Machinery Corp.**—R. C. Tierney, co-ordinator of the vertical turbine pump div. at Harrison, will be in charge of the new plant at Succassuna, N. J.

R. C. Tierney L. Van Bierkom

**Weston Electrical Intrument Corp.**—Leopold Van Blerkom is named ass't general sales manager of Tagliabue Instruments Div.

**Westinghouse Electric Corp.**—Mark W. Cresap, Jr., formerly a management consultant, is made a v-p and assistant to president. H. R. Michel is appointed assistant to v-p in charge of purchases and traffic. H. E. Plishker is the new manager of lamp sales.

**York Corp.**—R. F. Lauer has been named v-p in charge of engineering and research.

**Zonolite Co.**—Dr. G. F. Ziegler was named research director. He was director of research at Midwest Research Institute.

## OBITUARIES

**Benjamin Electric Mfg. Co.**—Rudolf William Staud, director of public relations and sales promotion, died March 28. He served the RLM Standards Institute as president and was a past-president of the Illuminating Engineering Society and the National Industrial Advertising Assoc.

**Formica Co.** — J. Roger White, v-p in charge of sales and advertising, died on March 18.

**General Electric Co.**—Guy A. Moffett, recently appointed ass't manager of engineering of the control divs., died March 27.

Elliott D. Harrington, vice-chairman and secretary of the defense projects and priorities committee of the small and medium motors divs., died April 1.

**W. M. Acker Organization, Inc.**—Wellington M. Acker died recently. He founded the company 25 years ago and was president and managing director until retirement in November.

**United States Steel Corp.** — Harry H. Lumley, retired Chicago district executive of the American Steel and Wire Co., died March 31.

# Take a "BIG BITE" out of Power Costs

## Put cost-cutting teeth in your V-Belt drives with DAYTON COG-BELTS*

★ 40% MORE H. P. PER BELT ★ FEWER BELTS
★ FEWER PULLEY GROOVES ★ LONGER BELT LIFE

Costs of power transmission come tumbling down with the premium Dayton Cog-Belt. Original cost is less. 5 Dayton Cog-Belts with rayon cords do the work of 7 ordinary V-Belts.

You save drive space. Cog-Belts let you use shorter center-to-center pulley distances — as much as 25% shorter.

Cogs are the only V-Belts scientifically built to bend, like your finger. They withstand flexing and compression strains better, run cooler, last longer.

To save money and drive space, get Dayton Cog-Belts. Ask your Dayton Distributor.

***"Cog-Belts on the ball!" says Maintenance Man***

Swedish ball grinders were chewing up steel cable V-Belts in 4 to 5 weeks. Reasons: small motor pulleys, and oil. Dayton BX60 Cog-Belts were tried on one machine, *more than doubled* best previous belt life. Now Cogs drive all the ball grinders. "Cogs are really on the ball!" says the company engineer.

DAYTON RUBBER COMPANY, DAYTON 1, OHIO

V-Belts by Dayton Rubber

*T. M.

WORLD'S LARGEST MANUFACTURER OF V-BELTS

# REVIEWS of RECENT BOOKS . . .

***Recent books, published for men responsible for The Engineered Plant Services, are reviewed here. Write to the publisher for those in which you are interested***

### Communications and Electronics

"Electric Engineers' Handbook, Electric Communication and Electronics," prepared by a staff of experts and edited by Harold Pender, Ph.D., Sc.D., and Knox McIlwain, E.S., E.E. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 1644 pages with tables, charts, graphs, and illustrations. Price $8.50.

To meet the growth of knowledge and greater degree of specialization in the field of electronics since the previous edition of 1936, this new volume has been entirely rewritten and expanded. Seventy-eight specialists in their respective fields have contributed articles on radio antennas, electric wave filters, sound reproduction systems, single-mesh and coupled circuits, transformers with iron cores, and many other subjects.

The handbook features a complete discussion of frequency modulation and pulse techniques in communication and radar. It also contains information on new radio devices for navigation, fundamental optics for television engineers, and the latest advances in the use of electricity in medicine.

Engineering consultant and editor, Harold Pender, was formerly dean of the Moore School of Electrical Engineering in the University of Pennsylvania. His co-editor, Knox McIlwain, is chief consulting engineer for the Hazeltine Electronics Corp.

### Transformers

"Transformer Engineering", second edition, by a group of General Electric Co. engineers: L. F. Blume, A. Boyajian, G. Camilli, T. C. Lennox, S. Menneci and V. M. Montsinger. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 500 pages; illustrated with charts, graphs and circuits. Price, $7.50.

The second edition is designed to take advantage of recent advances in transformer design in helping the engineer solve the technical problems involved in the specification, selection, application and operation of transformers. It is a detailed study of all phases of transformer performance and includes such items as connections, phase angle, load ratio control, characteristics of insulating materials, coordination of insulation and thermal characteristics. For example, the chapter on the last item has been completely rewritten to provide data which will enable the engineer to obtain maximum safe output under continuous overloads in cool ambients, and under short time overloads with moderate sacrifice of life expectancy.

Treatment of the material is such that the reader is carried logically from basic considerations to solutions that are adequate for most problems encountered in the plant. Examples and answers illustrate the various problems.

### Air-Conditioning

"Modern Air Conditioning," by Willis H. Carrier, chairman of the Board of Directors, Walter A. Grant, director of research, both of the Carrier Corp.; and Realto E. Cherne, consulting engineer. Published by the Pitman Publishing Corp., 2 West 45th St., New York 19, N. Y. 574 pages with graphs, charts, tables and illustrations. Price $10.00.

The rapid expansion of the heating, ventilating, and air-conditioning industry has outdistanced the published sources of information in this field. To meet this need, the Carrier Corp. has published this text, taking much of the material used in their own classes for training technical graduates for application-engineering assignments.

The new book will provide a thorough background in the field or serve as a handy reference to the engineer with occasional heating or cooling problems.

This second edition, after 10 years, covers both the theory and history of the problems and actual practice in the industry. The comprehensive appendix supplies 35 important tables for ready solution of many heating, ventilating, or air-conditioning problems.

### Radio-Frequency Power

"Radio-Frequency Heating Equipment," by L. L. Langton, A.M.I.E.E., published by Pitman Publishing Corp., 2 West 45th St., New York 19, N.Y. 196 pages including formulae, charts, tables, and illustrations. Price $3.75.

This book deals with the design of equipment for radio-frequency heating, and also with some applications of the technique. The reasons underlying the advantages gained by using the technique in these applications are fully discussed, serving as a guide to the advantages to be expected when the technique is applied elsewhere. However, the author has not intended that this volume should be regarded as a handbook, and the application of the technique is treated broadly.

The book will also make an appeal to the radio engineer who wishes to extend his knowledge of generation and transfer of radio-frequency power, some aspects of which are treated in an original manner.

# MEETINGS and EXHIBITIONS

***Highlights of coming meetings that will aid executives and engineers in planning itineraries. For additional information, please write sponsors of meetings***

### MAY

**Third World Petroleum Congress** will be held at The Hague-Scheveningen (Holland) from May 28 to June 6, 1951. For more information or copies of papers, write Office of Secretary, USA National Committee, K. G. Mackenzie, 135 East 42nd St., c/o The Texas Co., New York 17, N. Y.

**American Institute of Electrical Engineers** announce district meetings preceding the Summer General Meetings, Toronto, Canada, June 25-29.

Syracuse is the scene of the Northwestern District meeting, May 2 to 4.

The Great Lakes District meeting will be held from May 17 to 19 in Madison, Wisconsin.

**Society for Experimental Stress Analysis,** will hold its spring meeting at the National Bureau of Standards and the Wardman Park Hotel in Washington, D. C., on May 16, 17 and 18. All inquiries should be addressed to Dr. Edward Wenk, Jr., c/o The David Taylor Model Basin, Washington 7.

### JUNE

**International Commission on Illumination** will hold an annual session June 25 to July 4, 1951 in Stockholm, Sweden. New offices of the I.C.I. have been opened at 570 Lexington Ave., New York, N. Y., under direction of Secretary General R. J. Whitney.

**Oil and Gas Power Div. of ASME**—Twenty-third annual conference and exhibit will be held in the Baker Hotel, Dallas, June 25 to 29. Besides technical sessions, program includes inspection trips to the two largest internal combustion engine installations. ASME, 29 W. 39th St., New York, N. Y.

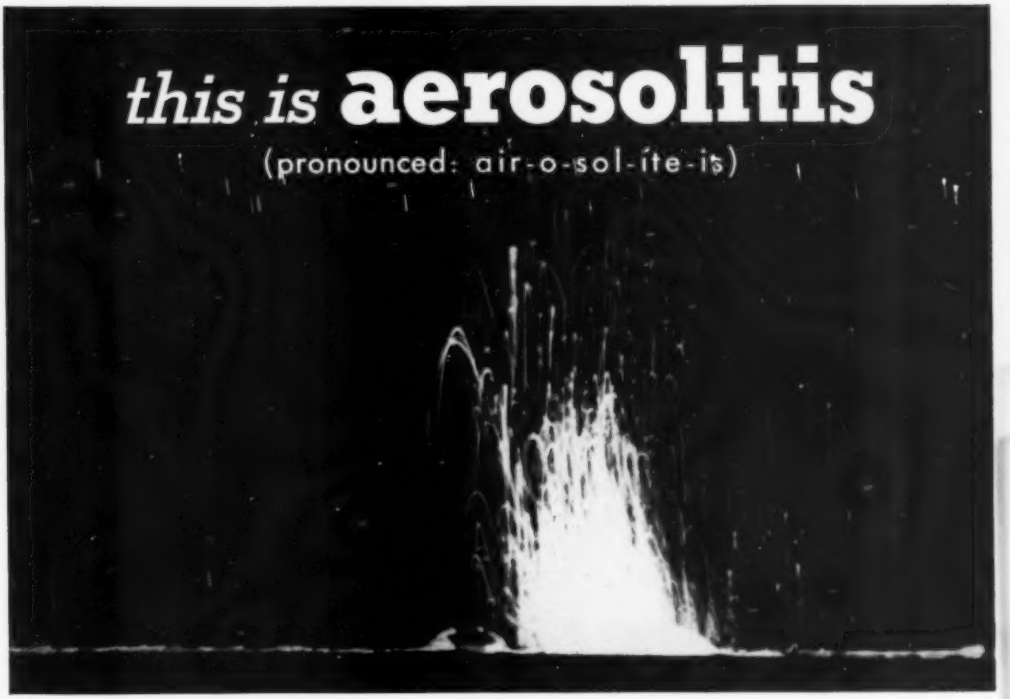
**Wisconsin Power Conference** takes place at the Schroeder Hotel, Milwaukee, June 6-8. For information, write George L. Smith, 6350 W. River Parkway, Milwaukee, 13, Wis.

### SEPTEMBER

**National Instrument Conference and Exhibit** will be held in the Sam Houston Coliseum in Houston, Texas, September 10-14. Write the Instrument Society of America, 921 Ridge Ave., Pittsburgh 12, Pa., for further information.

### OCTOBER

**National Association of Corrosion Engineers** holds the annual meeting of the South Central Region at Corpus Christie, Texas, October 18-20. G. A. Mills, Central Power and Light Co., is general chairman of the meeting.

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# prevent this boiler disease

Tiny drops of water—called *aerosols*—build up in the boiler water . . . more so in some waters than in others . . . and are carried along by the steam to form superheater deposits, foul turbine blades. When this happens, your boilers have *aerosolitis*, and costly shutdowns and repairs will result.

Preventing this boiler disease can be easily and inexpensively accomplished with Dearborn Improved Polyamide Anti-Foams which inhibit aerosol formation. In addition to this vital function, Dearborn Polyamide Anti-Foams prevent foaming to produce purer steam . . . eliminate scale formations . . . condition sludge . . . are compatible with other treatment.

If you produce steam for power or process use, investigate the benefits of Dearborn Improved Polyamide Anti-Foams.

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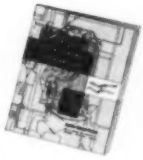

### *Write for Bulletins*

**Informative bulletins are available on (1) Dearborn Improved Polyamide Anti-Foams, and (2) Dearborn Industrial Water Treatment and Engineering Service. The coupon is for your convenience.**

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Gentlemen: Please send:

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THE LEADER IN WATER TREATMENT AND RUST PREVENTIVES

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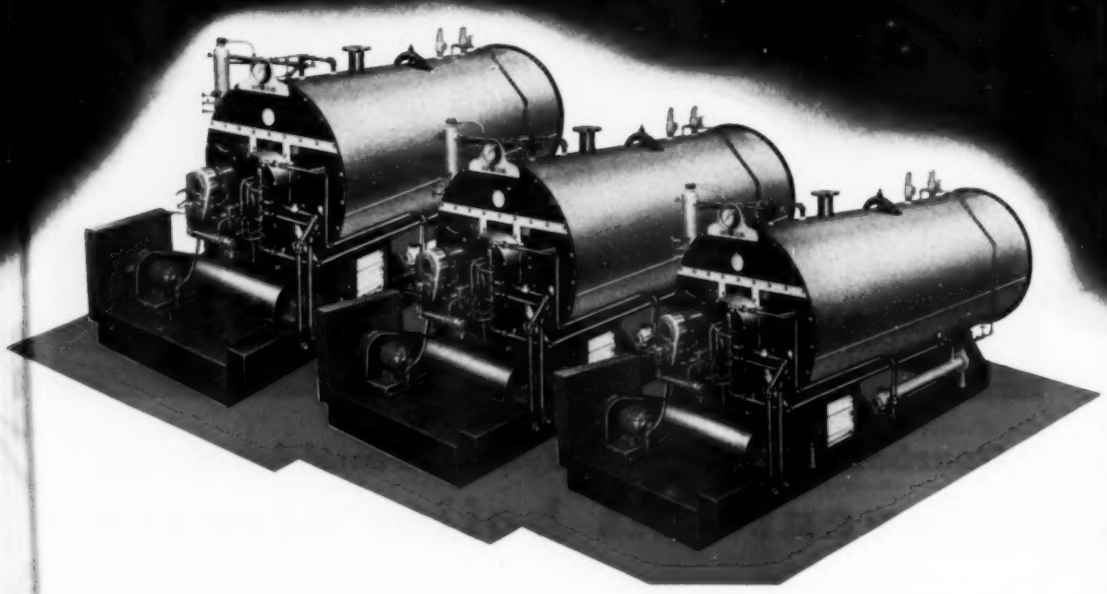
## WHEN YOU'RE COUNTING

# Superior STEAM GENERATORS



*Battery installations of Superior Steam Generators provide extreme flexibility to meet the most widely fluctuating steam demands. A hospital installation illustrates the point.*

*From early June through September, steam demand is limited to the needs of hot water and sterilization. Any one of the three units carries this load with ease . . . and at higher efficiency than could be obtained by minimum operation of a larger boiler.*

*When cold weather adds its heating load, a second Superior Steam Generator is fired. Only the most severe weather demands firing the third unit . . . which throughout the rest of the year provides stand-by equipment which is desirable in any operation.*

*By employing different combinations of the three, (7 in all) allowing each unit in turn to share the load; all enjoy longer life at maximum efficiency . . . and by using only the number dictated by the steam demand, maximum economy at every stage of steam demand is assured.*

*Let us show you how battery installation can serve you better in your new plant . . . or augment your present steam facilities.*

*Write today for Catalog 301*

Superior Combustion Industries, inc.

*Factory:* Emmaus, Pa

*Executive Offices:* Times Tower, Times Square, New York 18, N. Y.

# readers' guide to advertised products

**Here you'll find, briefly reviewed, all the booklets and leaflets offered in the advertising columns of this issue of INDUSTRY AND POWER. For easy reference, this listing is divided into various classifications of products. To get your free copies of literature described here and in the corresponding advertisements, list the key numbers of the paragraphs on the cards below and mail.**

### AIR & DUST FILTERS & COLLECTORS

**500—See page 37. Electrical Precipitation:** Write for your free copy of an informative booklet which presents full information on the Cottrell Precipitator. It effectively cleans stock gases by removing over 95% of all fly ash particles. Research Corporation.

**606—See page 120. Mikro-Collector:** Virtually no rival in the collection of radioactive dusts of ultra-fine particle size. It's both economic and efficient for jobs of (1) elimination of atmospheric pollution and (2) full recovery of a valuable product. Actual sample of felt used in the Mikro-Collector is offered. Write today. Pulverizing Machinery Co.

### ANTI-CORROSSIVE & PROTECTIVE COATINGS

**501—See page 29. Rust Preventive:** Rust-Oleum seals metal so that no rust-causing oxygen can reach it. Available in a full range of colors. Write for complete catalog. Rust-Oleum Corporation.

### BOILERS & BOILER ACCESSORIES

**502—See page 51. Baffles:** Enco streamlined baffles give you 4 major values—better heat transfer low draft loss; less steam and time for cleaning; custom installation. Write for Bulletin BW44 for full details. The Engineer Company.

**503—See page 50. Steam Generating Units:** A bulletin showing typical installations of this firm's Class VL units for power or processing loads, and heating will be sent upon request. Henry Vogt Machine Co.

**504—See page 128. Firebox Type Boilers:** Especially adapted for high pressure—10 to 304 hp, 100, 125, 150 lb wp. Send for full information and free 6 in. scale with pipe diameter markings. Kewanee Boiler Corp.

**505—See page 97. Vane Control:** Sturtevant Control is the economical way to obtain variable fan outfit at high efficiency. Write for Free Bulletin DB 92-810. Westinghouse Electric Corporation, Sturtevant Division.

**506—See page 38. Steam Power Plant Equipment:** Write for Erie City Bulletin SB37A containing complete engineering data for Types 3 V-C and 4 V-C 2-Drum water tube boilers for spreader stoker, underfeed stoker and oil or gas firing. Erie City Iron Works.

### BUILDING HEATING, VENTILATING & AIR CONDITIONING & REFRIGERATION

**507—See page 25. Trane Equipment:** Whatever your factory heating, ventilating, cooling or air conditioning problem is, look first in the answer in the Trane line. An inquiry will bring you complete data on equipment engineered for your particular job without obligation. The Trane Company.

**508—See page 149. Heating Equipment:** Hajoca Corporation takes pleasure in announcing it is now handling the complete Dunham line of top quality heating equipment—two well-known firms combined to give you one great service. Hajoca Corporation.

---

**To: INDUSTRY AND POWER, St. Joseph, Michigan** **May, 1951**

Please have forwarded to me, at no obligation, the literature I've indicated by the following key numbers:

***Inquiries for items listed in this issue not serviced beyond Sept. 1, 1951***

| *Advertised Products Numbers begins Page 117* | *New Equipment Numbers begins Page 10* | *New Bulletin Numbers begins Page 24* |
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**Your Name**_____ **Title**_____

**Your Company**_____

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# readers' guide to advertised products

### BUILDING MATERIALS & MAINTENANCE

**509—See page 143. Instant-Use Floor Patch:** Tough, plastic material which restores broken concrete to solid smoothness. Run traffic over it immediately. Write for details of free trial offer and "Hand Book of Building Maintenance". Flexrock Co.

**510—See page 146. Free Repair Handbook:** 40 pages describing Smooth-On repairs that can save you time and money. 170 illustrations. Write for your free copy now. Smooth-On Mfg. Co.

**511—See page 145. Vacuum Cleaning Equipment:** Your choice of 4 big-capacity portables. Also, stationary systems in a wide range of sizes to fit your maintenance or production operations. Write today for complete data and recommendations to fit your requirements. U. S. Hoffman Machinery Corporation.

### COAL, ASH & BULK HANDLING

**512—See page 30. Vibrating Screens:** Whatever your needs in vibrating screen equipment, Hewitt-Robins can fill them. Write for full information. Hewitt-Robins Incorporated.

**513—See page 134. Electric Vibrators:** If you have a troublesome bin or hopper write the details to Syntron. Their Engineering Department will be glad to give you their recommendations without obligation. Syntron Co.

**514—See page 43. Coal and Ash Handling Machinery:** See page 43 for illustrated Jeffrey equipment used in their new steam generating plant which conclusively demonstrates that savings can be increased with Jeffrey coal and ashes handling machinery. More complete information will be furnished upon request. The Jeffrey Manufacturing Company.

**515—See page 136. Silent Hoist Electric-Driven Car Puller:** Only one man and this car puller can pull and spot cars—warp barges—drop pallet or skid loads—bend pipe—open hopper doors—and cut your bulk handling costs. Get full information today by writing for Bulletin No. 64A. Silent Hoist & Crane Co.

**516—See page 132. Ash Handling:** Write today for print of typical Beaumont installations which show you how "Vac-Veyor" system will help you solve your ash handling problems. Beaumont Birch Company.

**517—See page 54. Bulk Materials Handling Systems:** Stephens-Adamson engineers are at your service to solve your bulk materials handling problems quickly and economically. Write today. Stephens-Adamson Mfg. Co.

### CONTROLS, REGULATORS & INSTRUMENTS

**518—See page 126. Steam and Water Mixers:** Give you a small, localized supply of warm or hot water. Economical, quickly pay back their cost. Easy installation. Write for free Bulletin 358-S. The Powers Regulator Co.

**519—See page 49. Pressure and Temperature Control:** Type ED pressure regulators assure accurate, dependable control with maximum money-saving performance. In sizes ¼" to 12" for service with air, steam, water, oil or gas. Write for complete details. Spence Engineering Company, Inc.

**520—See page 137. Jerguson Truscale Gage:** Reproduces your boiler water, deaerating tank, or other liquid level at remote points with accuracy as close as ⅛ of 1%. Write today for data unit on this exceptional gage. Jerguson Gage & Valve Company.

**521—See page 136. Regulators:** Valve-in-end construction gives you simple, compact design built for maximum performance. Stets Type G are setting new efficiency records daily. Write today for Bulletin 150. Stets Company.

**522—See page 142. Temperature Regulators:** Write for Stacon Bulletin 50-1000 for full details on extra sensitive, accurate, economical temperature regulators. Farris Stacon Corporation.

**523—See page 40. Temperature Control:** Leslie Class T and Class M temperature regulators with calibrated dial

*( Continued on page 120 )*

***Use these postage-free cards to order booklets and catalogs from advertisers, new bulletins and new equipment literature. List key numbers of the paragraphs describing the items you want in the spaces provided on cards below.***

FIRST CLASS
PERMIT No. 19
(Sec. 34.9, P.L.&R.)
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**BUSINESS REPLY CARD**
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

**2¢—POSTAGE WILL BE PAID BY**

**INDUSTRY and POWER**
**MAUJER PUBLISHING CO.**
**ST. JOSEPH, MICH.**

**To: INDUSTRY AND POWER, St. Joseph, Michigan** **May, 1951**

Please have forwarded to me, at no obligation, the literature I've indicated by the following key numbers:

***Inquiries for items listed in this issue not serviced beyond Sept. 1, 1951***

| *Advertised Products Numbers begins Page 117* | *New Equipment Numbers begins Page 10* | *New Bulletin Numbers begins Page 24* |
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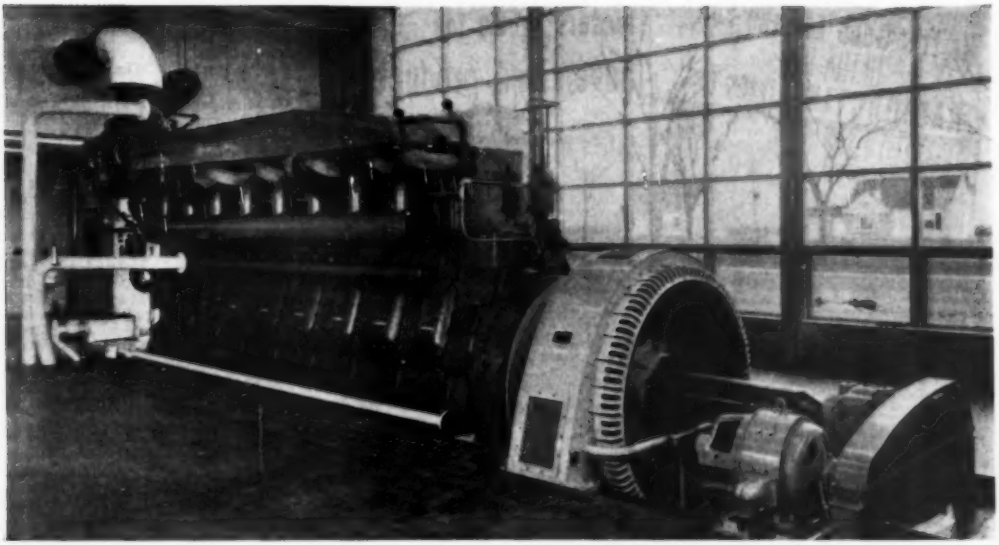
**Your Name**_____ **Title**_____

**Your Company**_____

**Co. Address (St. & No.)**_____

**City**_____ **State**_____



Typical Worthington supercharged engine-generator unit.

# Makes money when the load is low Makes more as the load grows

You take care of the present and future *both* when you put your electric power generation in the hands of a Worthington 4-cycle super-charged Diesel engine.

Records show that such an engine, even when operating at a low load factor, is economical and maintains its economical performance as the load increases through the years.

For example: a Worthington 1500-hp super-charged engine at 40% load produces more kw-hrs per gallon of fuel than a 1000-hp naturally-aspirated engine at 60% load factor.

So it's cheaper to install a 1500 hp-engine today than to install a 1,000 hp-engine today and a 500 hp-engine later.

When you buy a Worthington 4-cycle super-charged engine, you benefit, too, from the longest experience of any manufacturer with this type of engine. For *any* engine application, call on Worthington—an engine for any fuel: oil (crude or regular), gas or "dual fuel". Worthington's complete line of engines assures you of the most economical operation no matter what fuel you use.

If gas or any combination of gas and oil offer fuel economies, consider Worthington gas or dual fuel engines. Only Worthington offers such exclusives as dual plunger pumps, gas micrometering valves for each cylinder, and thermal air controls—all built to give optimum performance for the fuel used.

For further details of the dependable, economical Diesel performance that proves *there's more worth in Worthington*, contact Worthington Pump and Machinery Corporation, Engine Division, Buffalo 5, New York.

**WORTHINGTON**

E1.3

**ECONOMICAL CONTINUOUS POWER**
Diesel Engines, 150 to 2,640 hp . . .
Gas Engines, 190 to 2,880 hp . . .
Dual Fuel Engines, 345 to 2,640 hp.

**WORTHINGTON-BUILT AUXILIARIES**

Balanced Angle Compressors

Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative-Type Engine Water Cooler

IF IT'S GOOD ENOUGH FOR ULTRA-FINE RADIOACTIVE DUSTS IT'S IDEAL FOR YOUR MOST HAZARDOUS JOBS

Sectional view of MIKRO-COLLECTOR showing felt filter bags and reverse jet cleaning ring.

The MIKRO-COLLECTOR* has virtually no rival in the collection of radioactive dusts of ultra-fine particle size. Its installations for this purpose alone, during the past year, have a combined capacity of more than 100,000 cfm.

We can show you data which should leave no doubt in your mind that a MIKRO-COLLECTOR can handle your job economically and efficiently, if it falls in either of these classifications:

1—*Elimination of atmospheric pollution, regardless of the dangerous or noxious quality of the dust, or the minute size of the dust particles.*

2—*Full recovery of a valuable product.*

This is made possible by the MIKRO-COLLECTOR's pressed felt filter medium and its Hersey reverse-jet cleaning ring, which assure the very highest possible dust recovery.

**10 Reasons**

why a MIKRO-COLLECTOR will best help you win a war with Dust

1. Phenomenal Filter Rates
2. Highest possible recovery of solids
3. Require less filter surface, floor area
4. Extreme simplicity, low upkeep, minimum attention
5. Selected wool felt filtering medium
6. Reduced number of filter bags; quick changeover
7. Continuous, fully automatic operation
8. Uniform air flow
9. Easy handling of dust loads, damp or dry
10. Thorough survey and diagnosis of dust problem

*SEND FOR*—actual sample of felt used in MIKRO-COLLECTOR.

*Patents applied for by H. J. Hersey, Jr. and Pulverizing Machinery Company

PULVERIZING MACHINERY COMPANY
44 Chatham Road Summit, New Jersey

MIKRO-COLLECTOR
By the makers of MIKRO-PULVERIZERS and MIKRO-ATOMIZERS


# readers' guide to advertised products

*( Continued from page 118 )*

are time-saving, safe, rugged and simply constructed. Write for copy of Temperature Regulator Bulletin No. 464B. Leslie Co.

**524—See page 136. Automatic Liquid Measuring Gages:** Write for complete details on liquid level gages for measuring liquids of all kinds. Dial readings in feet, inches, gallons, pounds or any desired units. The Liquidometer Corp.

**525—See page 66. Measuring Devices:** You can obtain complete information in brochures describing force measuring devices, push pull gauges, traction dynamometers and laboratory scales by checking the brochure you need on the special coupon to be found on page 66. John Chatillon & Sons.

**526—See page 56. Low Pressure Gages:** Check your own low pressure measurement and gas or air flow problems with the advertisement on page 56 which shows 5 ways to use Hays' low pressure gages. Available at no cost is the useful Bulletin 49-667 which describes the complete line of Hays' low pressure instruments. The Hays Corporation.

**527—See page 132. Temperature Recorders:** Precision-built for your specific needs. Low-cost protection. Send for catalog showing Auto-Lite Temperature Recorders and Indicators. The Electric Auto-Lite Company.

**528—See page 150. Circuit Tester:** Model 785 gives you maximum, all around performance, 28 ranges in one case locates circuit troubles on production equipment in the shop; checks electrical equipment during manufacture on the bench; 28 ranges immediately available for research and development work in the lab. Write for full information. Weston Electrical Instrument Corp.

**529—See page 148. Regulators and Thermometers:** Bulletins 500 and 1000 give you full data on regulators and thermometers that will cut your processing cost to a new low. H. O. Trerice Co.

### ELECTRICAL DISTRIBUTION

**530—See page 46. Renewable Fuses:** You are invited to write for latest catalog for more information about "Economy De-Lay" Renewable Fuses, which give safe protection where most overloads occur—in the 135 to 200% range. Economy Fuse and Mfg. Co.

**531—See page 58. Stabiline Voltage Regulators:** Request your copy of Bulletin S351 containing technical data on Stabiline Automatic Voltage Regulators. The Superior Electric Co.

**532—See pages 32, 33. Fusetrons:** A fuse to which is added a thermal cutout offers large time-lag and less electrical resistance. Fits standard fuse blocks and may be used throughout entire electric system. Send for complete facts about Fusetron Dual-Element Fuses. Bussmann Mfg. Co.

**533—See page 39. I-T-E Switchboard:** To determine where you require additional current-carrying and interrupting capacities, the direct way is the best way. Just call in the I-T-E switchgear specialist who will give you expert estimates and recommendations. Write for details and dependable assistance today. I-T-E Circuit Breaker Co.

**534—See page 7. Isolated Phase Bus Structures:** Check page 7 for the list of requirements for a set of generator leads. I-T-E Isolated Phase Bus needs all these requirements and it's extremely easy to order. Further information will be sent without obligation. I-T-E Circuit Breaker Company.

### FUELS & FIRING EQUIPMENT

**535—See page 3. Fanmix Oil Burners:** Use coupon in this advertisement to get complete data on Coppus-Dennis Fanmix burners that allow you to get more heat release per cu. ft. of furnace volume. Coppus Engineering Corp.

**536—See page 42. Bell & Zoller Coals:** Four more mines have been acquired to raise coal producing capacity to the highest level in history and enables Bell & Zoller to offer you an even more diversified selection of top-quality brand coals. Write for full information on qualities of famous brands now offered by Bell & Zoller Coal Company.

**537—See pages 20, 21. RotoStoker:** The RotoStoker provides a double saving: saves first by increased efficiency. Saves again by burning any kind of bituminous coal or lignite. here are types and sizes of Detroit Stokers for every industrial need. Write for complete information without obligation. Detroit Stoker Company.

**538—See pages 8, 9. Perfect Spread Stoker:** Capacity range from 8,000 to 500,000 steam per hour—coal feeders are adjustable from 50 lbs. to 7500 lbs. of coal per hour. Mail coupon on page 9 today for a copy of the Perfect Spread Stoker booklet and for a reprint of a new report on large spreader stokers. American Engineering Company.

### HEAT EXCHANGER EQUIPMENT

**539—See page 121. Heating Specialists:** Every day more than 750, oil and gas fired, Petro-Chem Iso-Flow installations in the petroleum, chemical and allied industries, demonstrate the efficiency of their design and installation. Write for full details. Petro-Chem Development Co., Inc.

**540—See page 139. Evaporative Heat Exchangers & Water Coolers:** Great savings in cooling water and savings in piping, pumping and power return the cost to you quickly. The Niagara Aero Heat Exchanger can save you approximately 95% of your cooling water cost. Write for Bulletin 96. Niagara Blower Company.

### INTERCOMMUNICATION SYSTEMS

**541—See page 112. New Executone Intercom:** See page 112 for coupon which enables you to get, without obligation, complete descriptive literature on the new Executone Intercom which saves the valuable time of executives and employees. Executone, Inc.

### LUBRICANTS, LUBRICATION, OIL FILTERS & PURIFIERS

**542—See page 55. Colloidal Graphite:** Write for Bulletin No. 426-17E on "dag" colloidal graphite for general lubrication, extreme temperature lubrication, parting, impregnation, and opaquing. Acheson Colloids Corporation.

**543—See page 61. 11 Ways to Cut Production Costs:** Write for your copy of this free, new booklet which is yours without obligation. You will find handy coupon on page 61. Alemite Corporation.

**544—See page 136. Automatic Oilers:** Write for free oiler catalog. Trico oilers are a safe, sure, dependable way to simplified maintenance and reduced costs. Trico Fuse Mfg. Co.

**545—See page 130. Non-Fluid Oil:** Send for instructive bulletin and free testing sample of Non-Fluid Oil for positive bearing protection. New York & New Jersey Lubricant Company.

**546—See pages 35, 36. Stanolith Grease:** High mechanical and chemical stability plus extreme resistance to heat and water qualifies Stanolith grease to replace a variety of special greases. To obtain maximum benefits, use the services of a Standard Oil lubrication specialist. To arrange for his visit, write today. Standard Oil Company (Indiana)

### MATERIALS OF CONSTRUCTION

**547—See page 53. "How To Get Longer Service From Your Pumps":** That's the title of a booklet that belongs in the files of every man concerned with operating, maintaining, or purchasing pumping equipment. Be sure to write for your copy now. The International Nickel Co., Inc.

### MECHANICAL POWER TRANSMISSION

**548—See page 63. V-Belts:** When you buy V-belts, be sure to specify Gates Vulco Rope—gives you the money-saving "concave side" feature. Write for details. The Gates Rubber Company.

**549—See pages 26, 27. Chains:** This company specializes in the manufacture of sprocket chains, sprockets and attachments. An inquiry will show you how this specialization means better service to you. The Union Chain and Mfg. Co.

**550—See page 135. Gear Type Couplings:** For trouble-free coupling service write for full catalog on Waldron gear type couplings. Solid cover sleeve,

*( Continued on page 122 )*


• DIRECT HEATING OF VAPORS

• DIRECT HEATING OF LIQUIDS

*If your plant requires*

• DOWTHERM INDIRECT HEATING

• STEAM GENERATORS

• STEAM SUPERHEATERS

• WASTE HEAT BOILERS

**. . . place the selection of the specific type in specialized hands . . . and obtain optimum efficiency.**

**Petro-Chem Development Company engineers are heating specialists . . . they can supply the whys and wherefores of indirect versus direct heating and the economics of both.**

**Every day more than 750, oil and gas fired, Petro-Chem Iso-Flow installations in the petroleum, chemical and allied industries, demonstrate the efficiency of their design and installation.**

PETRO-CHEM DEVELOPMENT CO., INC.
120 East 41st Street, New York 17, N. Y.

*Representatives:*
Bethlehem Supply, Tulsa and Houston • Flagg, Brackett & Durgin, Boston • D. D. Foster, Pittsburgh
Faville-Levally, Chicago • Lester Oberholtz, Calif.

WILLIAMS-HAGER
flanged
Silent check
VALVES

Wherever Williams-Hager flanged Silent Check Valves are installed, plant maintenance men will tell you their costly water hammer troubles are over. These dependable, durable and compact valves can be placed in your water system in any position, including angular, and will provide maximum protection at all times. They are available for every service in standard pipe sizes from 1″ to 20″. Why not rid your plant of water hammer *now* . . . get Williams-Hager Check Valves.

Write today for Bulletin WH-100.

CHECK VALVES

THE WILLIAMS GAUGE CO.

Pump Valves . . . Water Gauges . . . Gauge Cocks . . . Steam Traps . . . Pump Governors . . . Feed Water Regulators . . . Water Columns

3100 PENNSYLVANIA AVE. • PITTSBURGH 33, PA.


# readers' guide to advertised products

*( Continued from page 121 )*

non-welded — no metal-to-metal wear —hermetically sealed. John Waldron Corporation.

**551—See page 113. Dayton Cog-Belts:** Put cost-cutting teeth in your V-belt drives. Dayton Cog-Belts mean 40% more horsepower per belt, fewer pulley grooves, fewer belts, and longer belt life. Complete data and cost information upon request. Dayton Rubber Company.

### THERMAL INSULATION

**552—See page 105. Industrial Insulation:** Send for complete information on B-H Block insulation made with black rockwool, flexible and easy to cut, fits tightly over irregular surfaces. Write today. Baldwin-Hill Co.

### PACKAGED STEAM GENERATORS

**553—See page 145. Amesteam Generator:** Dependable, quick steaming unit. Minimum installation expense, economical operation. Write for latest free bulletin. Ames Iron Works.

**554—See page 28. Forced Recirculation Steam Generators:** See page 28 for outstanding features of this Clayton self-contained steam plant. Use the coupon to request a desk demonstration of Clayton Forced Recirculation principle and/or catalog. Clayton Manufacturing Company.

**555—See page 116. Packaged Steam Generators:** New, fully illustrated Catalog 301 gives complete details for units available in 18 sizes. Write today. Superior Combustion Industries, Inc.

**556—See page 109. Cleaver-Brooks Steam Boiler:** Available in sizes 15 to 500 hp, 15 to 250 lb psi. Write for your copy of the Cleaver-Brooks steam boiler catalog — interesting, informative, beautifully illustrated. No obligation. Cleaver-Brooks Company.

**557—See page 57. Preferred Unit Steam** Generator: Check the important features of Preferred Unit Steam Generators that assure efficient economical service for an average of 25 years. Write for Bulletin 1000 today. Preferred Utilities Mfg. Co.

**558—See page 67. Cost-Saving Steam Generators:** Powermaster is a complete equipped steam plant, available in sizes from 15 hp up. You can burn light oil, heavy oil, gas or a combination of these three fuels. Wired, piped, insulated and tested at the factory. Get complete information by sending for Bulletin No. 1218. Orr & Sembower, Inc.

**559—See page 99. Steam-Pak Generator:** Steam-Pak Generators are built in capacities from 15 hp up, for low or high pressure, steam or hot water, for light or heavy oil, combination gas and oil, or straight gas. Write for complete data. York-Shipley, Inc.

**560—See pages 14, 15. 3,000 to 30,000 lb. range:** Units provide heating surfaces from 606 to 3,675 sq. ft. Pressure groups of 100 to 300, 450 or 850 psi. Fully automatic controls. Easily installed and adapted to various fuel and firing arrangements. For further information write Foster Wheeler Corporation.

### PACKING AND GASKETS

**561—See page 144. Quality Packings:** Outstanding quality and maximum service is the insurance you get with "John Crane" line of packings. Write for complete details. Crane Packing Company.

**562—See page 134. Dura Seal:** For melting the sealing requirements of volatile, corrosive or abrasive fluids. Write today for your copy of Bulletin No. DSIP covering Dura Seal applications. Durametallic Corporation.

**563—See page 64. High Pressure Packings:** Whatever your packing, gasket, or sheet requirements, consult your R/M catalog and call your authorized R/M packing distributor. If you have no R/M catalog, write for your copy today. Raybestos-Manhattan, Inc., Packing Division.

**564—See page 138. Palmetto Palco:** Can't score because it's built of cotton roving, each strand is separately saturated with a Palmetto lubricant. Friction is negligible. Available in coil or ring—plaited square to required sizes. Write today for full particulars on this and the full line of Palmetto packings for all industry. Greene, Tweed & Co.

### PIPE & FITTINGS

**565—See page 34. Flexible Metal Hose & Tubing:** Write today for Bulletins SS 50 and CC 300 for more data on these flexible connectors for almost any liquid, gas or semi-solid. American Metal Hose Branch, The American Brass Company.

**566—See page 146. Flexible Metal Hose:** Atlantic flexible metal hose has been tested to four times specifications for your protection. Write today for your free copy of Catalog No. 500. Atlantic Metal Hose Co., Inc.

**567—See page 125. Flexible Rotary Swivel Joints:** Barco factory and field engineers will be glad to help you solve your problems. Wide choice of styles and sizes available from ⅛″ to 2″. Gasket materials to meet your particular requirements. Write today for new Catalog No. 265. Barco Manufacturing Co.

### PUMPS

**568—See page 106. Unipumps:** For efficient liquid handling in your plant—application, installation, replacement—consult a Weinman representative. Unipumps handle up to 1000 g.p.m., heads to 500 ft. The Weinman Pump Mfg. Co.

**569—See page 52. Warren Pumps:** Be sure to check with Warren when you plan modernization or expansion of your plant. Send for full information

of complete line of pumps. Warren Steam Pump Company, Inc.

**570—See page 146. Viking Rotary Pumps:** For complete information about Viking Pumps, write for Bulletin 51SG. You'll find the style and size you need, correctly engineered to do your job. Viking Pump Company.

**571—See page 47. BJ Submersible Pump:** Offers you important installation advantages not found in any other pump. Get the full story on how BJ Submersibles can answer your needs by using the special coupon which appears on page 47. Byron Jackson Co.

### REFRACTORIES

**572—See page 124. Refractory Cement:** Bulletin R-53 describes Super #3000 Refractory that protects inside insulation of metal ducts, flues and breechings with maximum efficiency. Write today. Refractory & Insulation Corp.

**573—See page 17. Versatile B&W Kaocast:** 3000F Refractory Castable can be molded into special shapes quickly and easily. Can be cast directly in place or applied by cement gun. Write for complete details in Bulletin K 2. Babcock & Wilcox Co., Refractories Division.

### SOOT BLOWERS & TUBE CLEANERS

**574—See page 123. Rotojet Tube Cleaners:** Rotojet Tube Cleaners, from head to hose, are tailored to meet individual requirements and give you the best combination for a fast, thorough job. Send for new Rotojet Bulletin today. Elliott Company — Roto Division.

**575—See page 141. Tube Expanders and Cleaners:** Many types and sizes of flaring and non-flaring expanders are available immediately from large Wilson stock. Write for catalog which contains details on complete line. Also write for Bulletin 47-A for information on fast-acting Wilson tube cleaners. Thomas C. Wilson, Inc.

### STEAM SPECIALTIES

**576—See page 151. Yarway Steam Traps:** Maintain even temperatures because they continually sample and respond to a trickle of the condensate. Write today for full information on Yarway Impulse Steam Traps. Yarnall-Waring Company.

**577—See page 140. Steam Traps:** Easily installed Nicholson steam traps discharge air as efficiently as water; no air grinding; hardened stainless steel valve. Lengths, 18" to 40"—pressures, 0 to 250 lbs. without change of valve or seat. Write today for free Catalog 250. W. H. Nicholson & Co.

**578—See page 31. Steam Traps:** Unique Duo-Step design doubles drainage capacity to give you double value—lets you use smaller, less expensive traps to do larger drainage jobs. Send for complete information today. The Clark Manufacturing Company.

**579—See page 59. Steam Saving Equipment:** For increased production and

*( Continued on page 124 )*


# The less time and labor you have to clean tubes

## The more you need New, Powerful, Fast

## ROTOJET® TUBE CLEANERS

*ROTOJET Air-driven Motor Model 525 with short 4-arm head and universal joint for 2⅛" to 3" I.D. curved tubes.*

So powerful is the new Rotojet Motor that we have yet to find a scale-removal job tough enough to stop it. The simple, rugged Rotojet, with our exclusive Rotocentric bore cylinder, uses air sparingly. No leakage, no stalling at low speeds. Labor-saving air valve permits one-man operation. Try Rotojet and you'll never want to use any other make cleaner.

***SEND FOR NEW ROTOJET BULLETIN***

**ELLIOTT COMPANY-ROTO DIVISION**

**156 Sussex Avenue Newark 1, N. J.**

# Longer Service Life for Fan Housings

## *Despite Highly Abrasive Gases, Housings Show No Wear After Many Months of Hard Service*

**Because of the flow of fly ash at high velocity, the inside of the induced draft fan housing takes a severe beating due to erosion, particularly at the inlet boxes. Various refractory materials used in this equipment wear out in from 2 to 3 months, resulting in costly time loss and repairs.**

**A prominent public utility finally tried R & I Super #3000 Refractory Cement. This remarkable, easily mixed mortar was troweled to a ⅝" to ¾" thickness over expanded metal lath tack-welded to the inside of the housing. It air set to flint hardness. When inspected after 6 months of continuous, hard service, it showed absolutely no wear or cutting effects. Today, 10 months after its application, it is still in excellent condition.**

**Super #3000 is easy to apply and has remarkable resistance to all conditions at temperatures up to 3000°F. It permanently bonds new brickwork weld-tight and patches cracked, broken or eroded refractory surfaces, making them stand up indefinitely under the severest kind of service. As a longer-lasting refractory applied over insulation inside the ducts, Super #3000 also greatly increases duct life.**

**Investigate Super #3000—one of the R & I complete line of better refractory cements. Write for Bulletin R-53.**

R&I SUPER #3000 Refractory Cement for Bonding and Patching

REFRACTORY & INSULATION CORP.

118 Wall Street • New York 5, N. Y.

*Branches in Philadelphia*

*Newark, N. J. • Cleveland • Chicago*


# readers' guide to advertised products

*( Continued from page 123 )*

more uniform output in your plant, the answer may be a temperature control on hot water or a few dollars spent for individual traps on every steam coil. See page 59 for the Sarco products that do just that. More details gladly sent on request or a Sarco man will gladly look over your plant without obligation. Sarco Company, Inc.

**580—See page 2. Steam Trap Handbook:** Tables, charts, diagrams and rules for selecting traps make Armstrong's latest booklet a handy reference volume for every engineer's library. Write today. Armstrong Machine Works.

### TOOLS

**581—See page 131. Tube Cleaning and Expanding:** Write for sound advice and top service on your tube cleaning and tube expanding problems. Airetool products help you cut down time, give lower maintenance cost, more thorough scale removal. Airetool Manufacturing Company.

**582—See page 129. Power Pipe Machines:** You can save up to 80% on pipe threading time by using a portable Toledo No. 999 Power Pipe Machine instead of hand methods. Get full details from new catalog which is yours for the asking. The Toledo Pipe Threading Machine Co.

**583—See page 6. Proto Tools:** Send 10c today for the new 68-page catalog of PROTO Tools. Plomb Tool Company.

**584—See page 143. Combination Blower-Suction Cleaner:** It's a snap to rid all of your equipment of damaging dirt, dust, and grit with this portable cleaning tool. Write for more data. Clements Mfg. Co.

**585—See page 19. Masonry and Concrete Saws:** Send today for free information and literature on the new Clipper masonry saws and Clipper concrete saws. You will find a convenient coupon on page 19. Clipper Manufacturing Company.

### TURBINES

**586—See page 44. Special Purpose Turbines:** Many unusual combinations have been developed by Terry to meet out-of-the ordinary requirements in turbines up to 2000 hp. Write for special purpose turbine information. The Terry Steam Turbine Company.

### VALVES

**587—See page 127. Everlasting Valves:** Duplex unit gives doubly-safe boiler blow-off action. Everlasting Valve team assures practically zero maintenance as well as double safety. Write today for full information. Everlasting Valves.

**588—See page 122. Williams-Hager Check Valves:** Aailable for every service in standard pipe sizes from 1" to 20". Avoid costly water hammer troubles. Write today for Bulletin WH-100. The Williams Gauge Co.

**589—See page 60. Check Valves:** Chapman Tilting-Disc Check Valves practically eliminate pipe line stresses—head losses are reduced 65% to 80%. Write for bulletin with descriptive data. The Chapman Valve Mfg. Co.

**590—See page 130. Butterfly Valves:** Rockwell designs many valves for special applications. Write for catalog describing complete line of standard valves to 72" pipe size—manual or automatic controls. W. S. Rockwell Company.

**591—See page 45. Slotted Wedge Cast Steel Gate Valve:** Darling gate valves are made in wide range of sizes, types and constructions and for pressures up to 1500 lbs. Write for Bulletin No. 5003. Darling Valve & Manufacturing Co.

**592—See page 133. Pressure Valves:** For longer service, less maintenance and greater all-around dependability, specify and install Golden-Anderson cushioned valves. Descriptive bulletins available on request. Golden Anderson Valve Specialty Company.

**593—See page 100. Crane Valves:** Dependable quality Crane valves insure low maintenance costs. Ask your Crane representative for a demonstration or write for full details. Crane Co.

**594—See page 13. Blow-Off Valves:** Unit Tandem Blow-Off Valves constructed with special strength and toughness to withstand severest blowdown conditions. Write for Bulletin B-433. Bulletin B-424 describes lower pressure blow-off valves. Yarnall-Waring Company.

**595—See page 11. New Jenkins Valves for Safety and Economy in L.P.G. Services:** Specifically designed for the hazardous service represented by liquified petroleum gas. Superior safety features. Also recommended for air, gasoline, oil and similar services. For complete details and dimensions, get the new Jenkins L.P.G. Valve Folder, Form 197. Jenkins Bros.

**596—See page 4. 4 Important Bulletins:** Bulletin No. 711 contains latest design details, dimensions, weights, and installation information for relief valves; Bulletin 501 contains full details, dimensions of new all-purpose steel valves; Catalog 104 contains complete information on non-shock, ball & piston check valves. Bulletin 491 is a new bulletin on Edward instrument valves. Edward Valves, Inc.

**597—See page 23. Aloyco Valves:** Think of Aloyco valves first if your plant deals with corrosion or must guard everywhere against product contamination. Ask for specialized engineering assistance. Alloy Steel Products Co., Inc.

## WATER TREATMENT

**598—See page 142. Water Treating Equipment:** Get your copy of fact-filled bulletins giving complete data on manual or automatic equipment in all sizes, types and capacities. Hungerford & Terry, Inc.

**599—See page 146. Versene Test Kit:** Lets you test the hardness of water in your plant in less than two minutes. Includes enough chemical to make more than 50 separate tests. Refills available. Full directions in each kit. Write today. Bersworth Chemical company.

**600—See page 149. Automatic Softening:** The Belco Camomatic Valve replaces the seven individual valves required for normal operation of a softener. Readily adaptable to pressure filtration and other process control. Complete data available on request. Belco Industrial Equipment Div., Inc.

**601—See page 48. Hot Process Softeners:** In all Graver designs, the exceptionally low rising rate of treated water from the sludge bed to the discharge provides clearest treated water and least load on filters. Write for your copy of Graver's 36-page bulletin which describes these hot process softeners in detail. Graver Water Conditioning Co.

**602—See page 115. Write for Bulletins:** Informative bulletins are available on (1) Dearborn Improved Polyamide Anti-Foams, and (2) Dearborn Industrial Water Treatment and Engineering Service. If you prefer, use the convenient coupon on page 115. Dearborn Chemical Company.

**603—See page 138. Water Refining Equipment:** Do you want the right answer to your water softening or demineralizing problem? Let Refinite send you specially prepared, pictorial literature that shows how Refinite helps get the "right answer". Refinite Corporation.

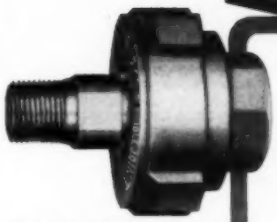
**604—See page 128. Water Treatment:** Write for detailed information about solving your water treatment problems. This complete service includes each step from original survey of problems to installation of water purification equipment. General Filter Co.

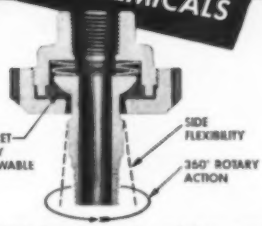
**605—See page 107. 8-Point Water Treatment Service:** Ask for a representative of this company to call and furnish full details on this 8-point service, all or any part of which is available to you. No obligation. The Bird-Archer Company.

**For your free copies of this new literature and more data on advertised products, list the key numbers of the descriptive paragraphs on one of the handy order cards on p. 117. Mail today—postage-free!**


# BARCO *Flexible Rotary* SWIVEL JOINTS

*For Handling*
STEAM • AIR • WATER
OIL • GAS • CHEMICALS





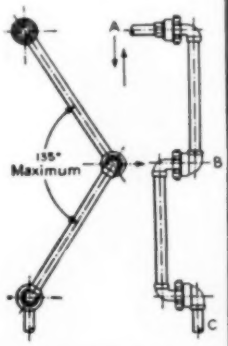

**Model SA-75-BCS**—Industrial Type Swivel Joint. Sizes ⅜" to 2".

HERE'S how to make piping connections to steam jacketed tilting kettles, press platens, low speed* revolving drums and rolls, and other moving equipment—*Use Barco Flexible Swivel Joints!*

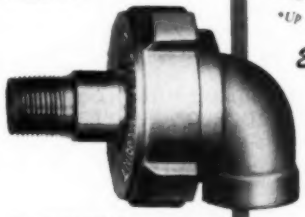
**FOR BETTER ENGINEERING!** Put flexibility where you want it—without the nuisance of sagging, flopping, non-rigid lines. Easy to position lines accurately for good drainage and good temperature control.

**NO BINDING—LOW TORQUE!** Barco's *exclusive* design provides for side flexibility—takes care of inaccurate pipe alignment, prevents binding. Where required, joints can be supplied without side flexibility.

**PRESSURE SAFE!** The seal will not break or blow out suddenly. High temperature and fire resistance. No swelling or expansion under pressure. Built for pressure ratings as high as 3,000 p.s.i., or higher under certain conditions. No leakage under varying conditions of vacuum and pressure. Joints function perfectly at extremely low and high temperatures.




**A TYPICAL APPLICATION**—To provide a piping connection from Point A (moving) to Point C (fixed). Install joint at A with axis normal to plane of motion of A. Install joints at B and C with axes parallel to axis of joint at A. Locate joints in plane parallel to plane of motion of A.



**Model SA-7AS-BCS**—Industrial Type Swivel Joint for angle connection. Sizes ⅜" to 2".

**Up to 30 RPM. For higher speeds, use Barco Revolving Joints.*

*Engineering Recommendations*

Barco factory and field engineers will be glad to help you solve your problems. Wide choice of styles and sizes available from ⅛" to 2". Gasket materials to meet user's particular requirements. *Ask for new Catalog No. 265.* BARCO MANUFACTURING CO., 1831F Winnemac Ave., Chicago 40, Ill. In Canada: The Holden Co., Ltd., Montreal.

# BARCO

**THE ONLY TRULY COMPLETE LINE OF FLEXIBLE, SWIVEL, SWING, AND REVOLVING JOINTS**

*Worldwide Sales and Service*

*FREE ENTERPRISE* — THE CORNERSTONE OF AMERICAN PROSPERITY

*For a Small, Localized Supply of Warm or*

**HOT WATER**

*Use*

**POWERS**

**STEAM and WATER MIXERS**

**ECONOMICAL**—Quickly pay back their cost. Thousands now in use. *Easy to Install.* Requires steam and water pressures above 10 lbs. Steam is mixed directly with water.

**MANY USES**—Industrial processes; 180° F. sterilizing rinse water for dishwashers; washing oil drums, trucks, etc.

**TEMPERATURE RANGE**—Any temperature desired between that of incoming water and 200° F.

**HAS PRESSURE EQUALIZING VALVE**—which prevents delivery temperature changes caused by fluctuating pressures of steam or water.

**SMALL SIZE**—½" pipe size can be held in the palm of the hand, has 5" dial; ¾" size has 7" diam. dial.

**CAPACITIES**—based on steam and water at 45 lbs. pressure each, water at 60° F., and delivery temperature of 160° F.: —½" size = 3 gals. per min.; ¾" size = 8 gpm. Mixing steam with 140° F. water increases delivery about 75%. Often used as a small booster heater. ***WRITE for Bulletin 358-S***

MAIL TO (SWA)

**THE POWERS REGULATOR CO.**
**2777 Greenview Avenue** **Chicago 14, Illinois**

Please Send Bulletin 358-S and prices

Name ..... Title .....

Firm Name .....

Address .....

# NEW EQUIPMENT AND DEVELOPMENTS

*( Continued from page 22 )*

integral part of the complete equipment. The recorder can be equipped to operate signals or controls. Applicable to roll diameters down to 9 in. and to flat surfaces, this detecting unit operates independent of surface speed, emission characteristics and finish. It can be mounted at the center of the roll or at any other location, wherever actual temperature measurement is desired.

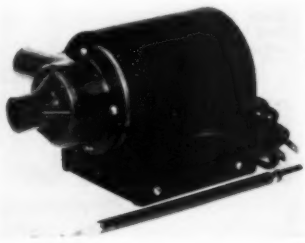
## 30—WATER DEVICE COOLS ROOFS

A nozzle has been developed by Siegfried Ruppright that will completely cover a roof with sprayed water. Evaporation of this water will reduce roof temperature and subsequent ceiling temperature. The nozzle has

a bore large enough to throw the water as far as 50 ft, and when rotated it will cover 2000 sq ft. Water is dispersed at the rate of 0.04 gal per sq ft per hr. The unit operates at any pressure, but at 12 psi the water throw is 19 ft, while at 40 psi the throw is 31 ft.

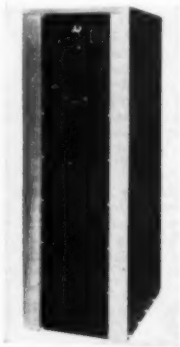
## 31—RUBBER PUMP HANDLES CORROSIVE LIQUIDS

The Gorman-Rupp Co. has announced a line of small centrifugal, all-rubber pumps for handling both corrosive and non-corrosive liquids that are powered by tiny electric motors of from 1/200 to 1/35 hp. They can be held on the flat of the hand and weigh from 2 to 4 lb and are available as all-rubber or as rubber and bronze or zinc. There are three types enclosed and skeleton units, motor driven and belt driven units. Overall capacity range is from 504 gph at 2 ft head to 78 gph at 10 ft head. A rubber volute and impeller are molded to a stainless steel shaft, which is mechanically connected directly to the motor shaft. A diaphragm and seal combination of molded rubber completely cover the metal supporting member that joins the motor and pump structures. The stainless steel shaft is the only metal in contact with the liquid.



## 32—INDUCTION REGULATOR NOW AVAILABLE

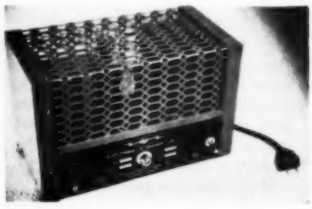
A complete line of three-phase dry-type induction voltage regulators to meet the ever-increasing industrial demand for regulated three-phase power at low voltages has been announced by General Electric's Transformer and Allied Product Div. Both self-cooled and forced-air-cooled regulators are included in standard 10 and 20 per cent ranges of regulation. This standard line is being offered in ratings from 120 to 500-v and from 12 to 85-kva. Three-phase dry-type ratings have been available in these sizes in the "triplex" assembly, which consists essentially of three single-phase regulators on a single base. The three-phase winding arrangement on a single core makes



possible a considerable saving for users of three-phase voltage regulators. Housed in an all-steel, ventilated cabinet, the unit is protected from excessive dust collections by the cabinet design.

## 33—ELECTRONIC CELL HAS STABILITY

An electronic standard cell is announced by the Hastings Instrument Co., Inc. This unit provides a d-c reference voltage stable



to 0.25 per cent. Output ripple on the low current models is less than 0.01 per cent. Stability is maintained under wide temperature range operation and continuous, long term use. It is immune to damage by momentary short circuits and is unaffected by temperature changes. The unit is for use with self-balancing potentiometers, wire strain-gages, recording oscillographs, resistance thermometers, and other applications that require a stable d-c source. Operates from an a-c source with 90 to 130 v and 50 to 500 cycle.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

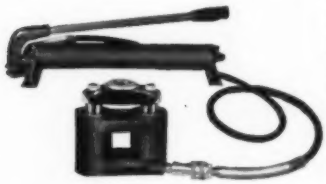
## 34—POWER SOCKETS HOLD MAGNETICALLY

Snap-On Tools Corp. announces a line of magnetic power sockets in ¼, ⅜, and ½ in. square drive sizes. These sockets are especially useful for the self-tapping screws now being used in increasing numbers for all types of assembly work. A magnet is imbedded in each socket and holds these flat headed screws firmly, making it easy

to insert and install them just where they are needed. As standard handles and extensions can be used with the sockets, they speed up the job of starting these screws, especially in restricted and hard-to-reach places. Use of these sockets eliminates the danger of screws falling into inaccessible places that might entail a major disassembly job to remove them. These sockets will prove equally useful for starting and removing regular bolts and nuts in restricted spots.

## 35—HYDRAULIC PULLER DEVELOPS 10,000 PSI

Now almost any pulling or pushing job can be done easily, quickly and safely with a new light-weight compact hydraulic puller just announced by the Owatonna Tool Co. Weighing less than 10 lb and developing 15 ton of force, the device has a cen-




These EVERLASTING advantages give better service from

Fig. 4001/6561. Duplex unit consisting of Straightway Lever-operated Sealing Valve and Angle Blowing Valve.

BOILER BLOW-OFF VALVES

When you install an EVERLASTING Duplex Blow-Off Unit, you'll find that its many superiorities speak for themselves.

The sealing valve at the left is the EVERLASTING design that has been famous for more than 40 years . . . the valve with the drop-tight seal that actually improves with use because of its self-lapping action each time the valve is opened or closed . . . the valve that can't stick or jam because of its non-wedge design . . . the valve that opens in less than a quarter turn to provide unimpeded straight-through blow.

The blowing valve at the right is the equally famous EVERLASTING Angle or "Y" Valve, specially designed and equipped to withstand repeated blow-off shocks, erosion and corrosion, and without pockets that might trap and hold solids.

Each of these valves . . . and all the other EVERLASTING Boiler Blow-Off valve types, fully meet ASME code requirements . . . assurance that they are properly designed and amply strong for the service.

Write for descriptive bulletin

EVERLASTING VALVE CO.
49 Fisk Street, Jersey City 5, N. J.

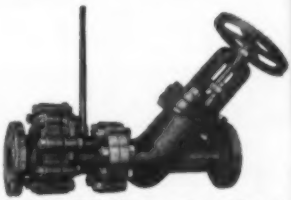


Fig. 4001/6571. Duplex unit consisting of Straightway Lever-operated Sealing Valve and Y Blowing Valve.

Fig. 6571/6561. Duplex unit consisting of Y Sealing Valve and Angle Blowing Valve.

Fig. 6561/6571. Duplex unit consisting of Angle Sealing Valve and Y Blowing Valve.

Everlasting Valves

TRADE MARK "EVERLASTING" REG. U.S. PAT. OFF.

EV-340

FOR EVERLASTING PROTECTION

**BETTER WATER**

**IS A TRUE ECONOMY**

*(not a luxury)*

Clean, bright water with hardness, iron, taste and odor removed saves money in many ways. Costs of manufacturing, processing, heating, cooling, cleaning and boiler maintenance go down as water quality goes up. If water quality is wasting profits it will pay to ask for a survey of your problem.

General Filter Co. is part of the LAYNE organization with engineering and construction facilities in every area. A complete service is offered, from the first survey through design, construction and erection of low cost, high efficiency water purification equipment.

***Write for Detailed Information Today***

*A Layne Affiliate*

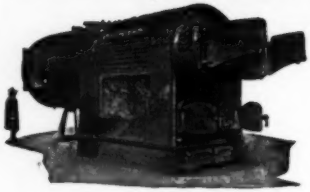
**GENERAL FILTER CO.**

923 2nd St. • Ames, Iowa



**KEWANEE**

**HEAVY-DUTY**



**10 to 304 hp**

**100, 125 and 150 lbs wp**

Has all the characteristics which make firebox boilers ideal for high pressure. Complies fully with ASME and SBI codes.

Outstanding for extra years of dependable service in producing hi-pressure steam economically with Oil, Gas or Coal.

WRITE Department 96-D5 749
*for 6" scale with pipe diameter markings*

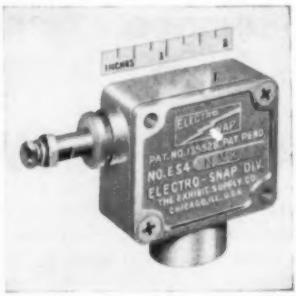
**KEWANEE BOILER CORPORATION**

KEWANEE, ILLINOIS


ter hole, which makes it quickly and conveniently adaptable to all OTC pulling systems. The ram travels 2 in., which is adequate for 95 per cent of all the pulling jobs. A remote control pump develops 10,000 psi. Six feet of high pressure hose allows an operator to stand a safe distance from work. Wire guards protect hose and special non-leak couplers are tested for 24,000 psi.

## 36—LIMIT SWITCH AIDS CYLINDER OPERATION

Electro-Snap Div. of The Exhibit Supply Co. designed a limit switch especially for use with momentarily-pulsed, solenoid-operated valves for air and hydraulic cylinder circuits. The "on" time length is varied so that it will give 1/10 to 2/10 sec impulse to the momentarily pulsed valve. A slowly actuated switch, for instance, need only be




"on" for 1/16 in. of plunger travel. Faster switch actuation may require as much as 5/16 in. "on" period to furnish a 1/10 sec impulse. Momentary pulsing type limit switches are furnished in 1/16, 1/8 and 3/16 in. standard lengths and can be furnished with "on" time lengths up to 3/8 in. on special order. An adjustable plunger head is a feature made possible by a built-in 10-32 screw that allows lengthening of the plunger to 1/2 in.

## 37—LIQUID TILTER MIXES AND POURS SAFELY

The GS Easy-Pour tilter No. 15 provides a safe and easy method of pouring liquids from cans into small containers. Built on scientific lines, it is designed to prevent accidents caused by spilling, splashing and carelessness in pouring liquids. Cradle is made of steel, fits any standard 5-gal can. All members are riveted or welded to insure a strong and durable device. Excellent for mixing or pouring. A few rocking motions and ingredients are thoroughly mixed.

## 38—SMALLER ROUGH-SERVICE LAMPS NOW AVAILABLE

A smaller, 100 w rough-service lamp that fits standard wire-guard extension-cord equipment is available from Westinghouse Electric Corp. Applicable to all types of service, this lamp emits more light from a smaller breakage-resistant bulb. It is 2 5/8 in. in diameter with a maximum length of 5 5/16 in. from top of bulb to bottom of base. Voltage ratings range from 110 to 300

v with a corresponding approximate average initial lumens of 1210 to 750. All ratings are designed for a life of 1000 hr. The lamps are available in clear or frosted.

## 39—PILE HAMMER DIESEL OPERATED

Syntron Co. has available a commercially self-contained diesel pile hammer, which requires no auxiliary equipment—such as steam boilers or air compressors—to maintain pressure. This pile-driving tool is 15 ft 6 in. long, has a 20 in. dia and weighs 11,000 lb. Despite this compact size and light weight, the hammer delivers driving energy at the rate of 16,000 ft-lb per stroke and is capable of 85 strokes per min. The weight of the ram or the striking part is 5,400 lb and the maximum power stroke

is 4 ft. The hammer fits in standard 20-in. leads, can easily be handled by a gasoline or diesel operated crane, and requires two lines—one for lifting the hammer, the other for lifting the pile and for starting the hammer by lifting its piston. One-man operated, the force of each blow is remotely controlled by a hydraulic system, which operates similarly to automotive hydraulic brakes. The force of each blow can be varied from zero to full power, and the unit will idle without impact or stalling.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

## 40—VARIABLE SPEED PULLEY HAS 3 TO 1 RATIO

Providing infinitely variable speed changes in the 15 hp range, this 3 to 1 pulley, manufactured by Gerbing Mfg. Corp. is

dynamically and statically balanced and uses a standard vari-speed rubber V-belt. The rack and gear arrangement is said to positively control the sheave movement and assure perfect belt alignment throughout the entire speed range. Result is a longer belt life and a smooth vibrationless drive.

## 41—BUNDLING CHAIN HAS AUTOMATIC LOCK

An idea for bundling materials for storage has just been announced by American Chain Div. of American Chain & Cable Co., Inc. It is the Acco bundling chain with automatic lock that permits bundles to be stored indefinitely and held securely, thereby eliminating the use of pins, pear-shaped links and wires usually needed for

TOLEDO MACHINE THREADS

*Million dollars' worth of pipe!*

**USED 20 YEARS BY TEXAS PLANT**

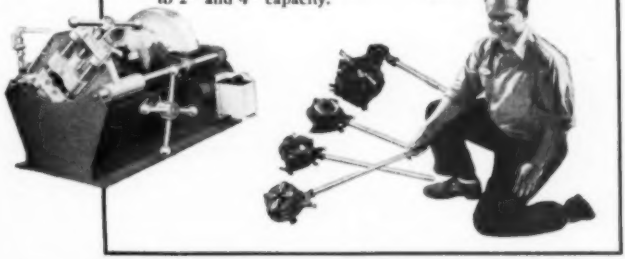
"We use a Toledo #999 2" Pipe Machine daily in fabrication of our water treating equipment," says E. B. Hudson, Jr., president of Hudson Water Softener Corp., San Antonio, Texas. "It has cut the threads on over a million dollars' worth of pipe since August 1931."

Mr. Hudson delcares, "I know of no equipment we own that has given more satisfaction than our Toledo #999 at less operating cost."

This machine makes friends with users everywhere! *Speeds production . . . cuts costs!* Threads 2" pipe in 22 seconds . . . cuts off 2" pipe in 10 seconds. Compact . . . portable . . . efficient . . . use it anywhere in your shop, plant or on the job. Your choice—Wheel or Knife Cut-Off. Toledo-built dependability. Write for catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

*Your Choice...*

Tool up *right* with TOLEDO! Hand tools, all pipe sizes, ⅛" to 12" and ¼" to 1" bolts. Power pipe machines, up to 2" and 4" capacity.



RELY ON THE LEADER

TOLEDO

PIPE TOOLS...POWER PIPE MACHINES...POWER DRIVES

**ROCKWELL**

**BUTTERFLY VALVES**

**for Air · Gas · Liquids · Solids**

Whether it's by manual control or remote, automatic control, these valves provide efficient, positive, uniform flow regulations at any desired, visible degree of valve opening. When entirely open, valve area is practically as free as the pipe line itself, without bends or seats to cause undue pressure drop or turbulence.

Construction — of any desired metal. Pipe sizes — to 72". Operating pressures — standard, to 25 p.s.i., special, to 125 p.s.i.

*Write for Bulletins*

**W. S. ROCKWELL COMPANY**
230 ELIOT STREET • FAIRFIELD, CONN.



**NON-FLUID OIL**
TRADE MARK REGISTERED

**Imitated...but never equaled**

NON-FLUID OIL is identified by our *sprocket wheel trade mark* which appears on every shipment . . . large or small. NON-FLUID OIL has been widely imitated . . . but never equaled.

We cannot emphasize too strongly that NON-FLUID OIL is a specialty lubricant . . . sold only by "performance standards." NON-FLUID OIL is produced in grades exactly suited to the particular need of each type of industrial machinery . . . each grade having been "service tested" to prove its superiority over ordinary oils and greases.

Write for instructive bulletin and free testing sample of NON-FLUID OIL.

**NEW YORK & NEW JERSEY LUBRICANT COMPANY**
292 MADISON AVENUE, NEW YORK 17, N. Y.—WORKS: NEWARK, N. J.

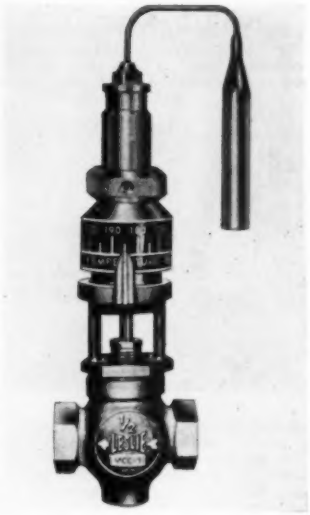
WAREHOUSES: Atlanta, Ga. • Birmingham, Ala. • Charlotte, N. C. • Chicago, Ill. • Columbus, Ga. • Detroit, Mich. • Greensboro, N. C. • Greenville, S. C. • Providence, R. I. • St. Louis, Mo.

*NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our manufacture.*


binding the bundles of material. The device is available as a separate unit or as part of a chain assembly. At the present time it is being manufactured for 17/32, 9/16, 5/8, and 21/32 in. chains. Assemblies can be furnished with regular wrought iron, low carbon, high test or alloy chain, depending on the type service and weight of load to be bundled and lifted.

## 42—DIAL MATCHES TEMPERATURE REGULATOR

A calibrated dial for use with Leslie Class T and Class M type temperature regulators has just been announced by the Leslie Co., manufacturers of reducing valves, pressure and temperature controllers and strainers. The dial embodies several features, which assure quick, easy and



dependable temperature settings. It is time saving in that a quick dial turn to the desired setting is all the attention that is necessary. There is no need to wait for equipment to heat up to find out if the setting is correct. Designed for long life under severe operating conditions, the dial fits in place of standard adjusting sleeve. There are no complicated linkages or gages to go out of order or to add friction.

## 43—GRAPHITE BEARING DESIGNED FOR 600 PSI

The Graflube Bearing Co. has a machinable graphite impregnated bearing requiring no lubrication or maintenance. It is designed for unit loads approximating those of standard design practice for bronze sleeves or about 600 psi. On tests, however, loads as high as 1100 psi have been applied for protracted periods with negligible wear. Essentially a slow speed bearing, it can be operated at high speeds under fluid immersed conditions. The unit is impervious to salt or fresh water, most hydrocarbons and has high resistance to weak acids and bases. Adaptable for continuous operation under temperatures ranging from — 50 to 450 F and to any practical size and shape. In block form, the bearing material has been in use for over eleven years on oilfield

pumping equipment. These bearings normally are completely unprotected but wear has been negligible under the worst conditions of weather and windblown abrasives. Periodic wear observations under difficult conditions have been taken for over 2 years on sleeve bearings of 3/8 in. wall thickness and in no instance has wear exceeded 0.0025 in. It was noted that between 0.0015 and 0.002 in. of this wear occurred between the time of installation and first measurement 3 months later.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

## 44—POTENTIOMETER MEETS RIGID SPECIFICATIONS

A special potentiometer developed by Clarostat Mfg. Co., Inc. meets exceptional rigid mechanical and electrical specifications. This control was designed, tooled and produced in limited quantities as a special number. The tapered winding is held to a

tolerance of ± 1½ per cent linearity as measured at ten test points. Mechanical tolerances are held ± 0.00025 in. The unit will operate dependably over the extreme ranges of temperature, humidity, altitude or barometric pressure and under severe vibration. It is treated to meet fungus and corrosive conditions. The body is molded in yellow or low-loss bakelite. Positive low-loss conductivity is assured by a silver contact carried by the ring-shaped slider, which rides the winding as well as the contact rail.

## 45—LUBRICANT IS NON-MELTING

Specialty Products Co. announces a new lubricating grease for use on either plain or anti-friction bearings in all locations in industry where both "cling" and lubricity should be maintained despite high operating temperatures. This material does not melt, even under the highest temperature conditions where lubrication is required. It is a synthetic grease, containing no metallic soaps, fatty acids, filler, water or alkali and is completely stable under all conditions of service and storage. Lubricity is held and perfect adhesion is maintained at the most elevated temperatures.

## 46—D-C WELDER USES SELENIUM RECTIFIER

Miller Electric Mfg. Co. announces a welder with a-c advantages. Made in two models—40 to 250 amp and 60 to 375 amp, its features are: arc start surge, electric current control making possible remote control operation, no moving parts to wear

In every production race time is an exacting taskmaster. Equipment that clips minutes from previous job time helps win this race. And today the race is on in earnest. AIRETOOL maintenance equipment, long recognized for dependability, is equally well-known for SPEED. Tube cleaners remove every type of scale deposit from every size and type of tube. Expanders and accessory tools also help keep industrial down time to a minimum.

**TUBE BUNDLES NOW ROLLED TWICE AS FAST**

Even an inexperienced operator can use this new AIRETOOL tube rolling control with uncanny accuracy and greatly increased speed. Jobs that used to take a full day are now finished in four hours or less. The control automatically shuts off the motor when the tube is properly expanded. No more over expansion. No more under expansion. Uniform rolling every time.

**MOBILE UNIT FOR CONVENIENCE**

Save additional time with this control. Necessary equipment can be carried in its truck and pushed from job to job in much less time.

•

Give AIRETOOL equipment a critical trial and get time on your side.

•

Write The Airetool Mfg. Co., 318 S. Center St., Springfield, Ohio.

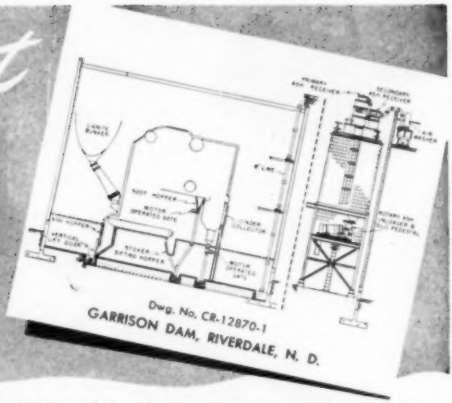
BRANCH OFFICES: New York, Philadelphia, Chicago, Houston, Tulsa, Baton Rouge

AIRETOOL
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

There's an AIRETOOL Tube Cleaner and Tube Expander for every Type of Tubular Construction

Beaumont

SOLVES LIGNITE ASH HANDLING




At the GARRISON DAM, RIVERDALE, NORTH DAKOTA, this Beaumont installation handles lignite ash and soot with a steam actuated Vac-Veyor System. Under this system, clogging of the venturi and resultant shut-down have been eliminated. Also, as shown above, the air washer is located inside the boiler house; this prevents the water from freezing during North Dakota's sub-zero winter . . . Whether your material handling problem is unusual or not, write today for prints of typical Beaumont installations.

Beaumont BIRCH COMPANY

1509 RACE STREET, PHILADELPHIA 2, PA.

DESIGNERS—MANUFACTURERS—ERECTORS BULK MATERIAL HANDLING SYSTEMS

Depend on

AUTO-LITE

FOR TEMPERATURE INDICATION

Auto-Lite Thermometers are designed to give you the broadest selection for your needs: Priced low and precision-made for accuracy, these instruments point the way to temperature savings and help to prevent spoilage. Write for catalog showing the many styles and types of Auto-Lite Thermometers that are available.

TYPICAL APPLICATIONS: STORAGE TANKS & ROOMS, COOLERS, DRYERS, AIR CONDITIONING, PILOT PLANTS.

*Illustrated, at top: Model G Indicating Thermometer, flush mounting type with capillary tubing for remote reading. Priced from $18. At bottom: Model V Thermometer (vapor pressure type). Rigid stem for direct mounting. Priced from $10.25.*

THE ELECTRIC AUTO-LITE COMPANY

INSTRUMENT AND GAUGE DIVISION, DEPT. M-8

TOLEDO 1, OHIO

NEW YORK • CHICAGO • SARNIA, ONTARIO

INDICATING & RECORDING THERMOMETERS


and cause noise, no replacement stock such as brushes and bearings, instantaneous voltage recovery, quiet operation, less arc blow than standard d-c welders and no accidental polarity reversal. Standard input power requirement is 220/440 v, three-phase, 60-cycle. The knob type current control and "off and on" switch is located on the front panel. The welders can be used effectively for inert gas welding processes. Units can be paralleled for high current application.

## 47—STEAM-JET CLEANER ELECTRICALLY OPERATED

A low cost steam-jet cleaner has been announced by Livingstone Engineering Co. This model, JC-10, is the latest addition to the company's line of all-electric steam-jet cleaners and requires only 18 x 14 in. floor space. It can be maneuvered through the narrowest aisles, weighs less than 100 lb and is equipped with 8 in. rubber-tired wheels to provide maximum portability. There is no flooding of the working area, no smoke, flame or fire hazard. The unit is completely free of low-water danger. The boiler water is the electric resistance heating element, and the boiler is built under ASME Code, carries National Board stamp and is Underwriters' Laboratories listed. Designed to operate on 220-v single phase but can be adapted to 115-v at reduced output. It is also available for 3 phase, 220, 440, 550-v.

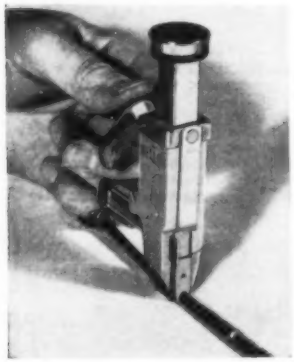
## 48—RUBBER COVERED FLASHLIGHTS AVAILABLE

Two and three-celled rubber flashlights that are breakproof, waterproof and damageproof are now available from Lennan Products, Inc. Engineered for greater light and longer life, they can be focused for a wide beam or spotlight. Moreover, the rubber case protects both the flashlight and the

articles with which it comes in contact. Neither excessive moisture nor dryness affect the instant operation, making this flashlight ideal for use under extreme weather or industrial conditions. The specially engineered head design facilitates easy changing of batteries or bulb. Models A2 (two-celled) and A3 (three-celled) are available with focusing bulb (less batteries). Belt rings can be installed.

### 49—AUTOMATIC TACKER CUTS COSTS

Tiny as a toy, yet as efficient as a large industrial staple tacker, this pocket-size tool has been developed by the Heller Co. to effect savings of time and money in making wire installations. It speedily staples braided, rubber-coated, single and double strand wire and hollow tube lines. Front and rear



guides circle the wire and permit rapid drawing around difficult angles or corners, along baseboards, plaster walls, window frames, ceilings, door jambs and rafters. Improved staples, made in several colors, are used. Driving points on staples easily penetrate plaster, composition board, hard and soft woods (with holding power to 64 lb). Drives the staple to a desired depth without marring or injuring the wire.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

### 50—ATTACHMENT SPEEDS LAPPING OPERATION

Two special standard attachments for the Crane Packing Co. Lampmaster enable users to speed production and simplify handling of certain types of parts. These developments, the "roller bar" attachment and pneumatic lifts, were recently introduced to bring a wider range of work to the point of practicality in lapping. This attachment was designed primarily to facilitate loading and unloading of tall or large parts. Instead of the overhead spider bar, it makes use of brackets mounted outside the circumference of the lap plate. Elongated slots allow adjustment of these conditioning ring holding brackets. Complete accessibility of the lap plate is afforded with this arrangement. When large numbers of small parts must


**You Get Longer Service, Less Maintenance, Greater All-Around Dependability with**

**GOLDEN-ANDERSON**

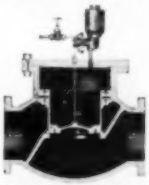
**Cushioned**

*Steam and Water Pressure Valves*

***One of these eight valves will ideally meet your requirements***

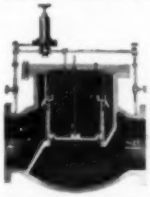
Single-Acting Non-Return Valve

Altitude Control Valve



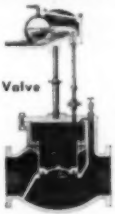
Solenoid Operated Electric Water Service Valve

Surge Relief Valve



Water Pressure Reducing Valve

Swing Check Valve



Cold Water Float Valve

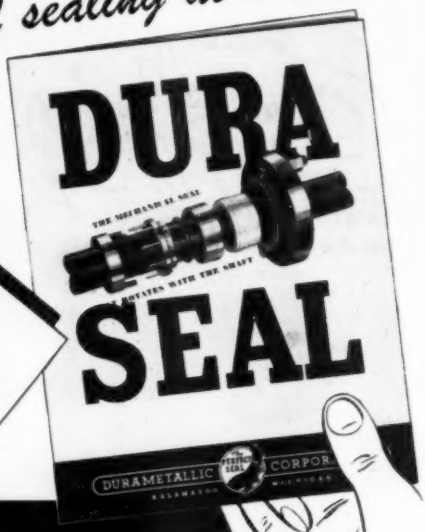
Triple-Acting Non-Return Valve

*Our descriptive bulletins covering these various valves gladly sent on request.*

GOLDEN ANDERSON *Valve Specialty Company*

2095 KEENAN BUILDING • PITTSBURGH 22, PA.

DURA SEAL means mechanical sealing at its best!

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DURAMETALLIC CORPORATION
KALAMAZOO, MICHIGAN

Of course.... Another Syntron Electric Vibrator

This V-25 Electric Vibrator on hopper supplying bucket elevator keeps material flowing freely, without surges, and without periods of coming "short".

SYNTRON
"Pulsating Magnet"

ELECTRIC VIBRATORS
With Variable Control of Power

3600 controllable vibrations per minute keep even the most stubborn materials flowing freely thru bins, hoppers, chutes and screens . . . WITHOUT THE HAMMERING AND RODDING AND POKING THAT WASTES MANPOWER AND DAMAGES EQUIPMENT.

For 1 cu. ft. hoppers up to large storage bunkers.

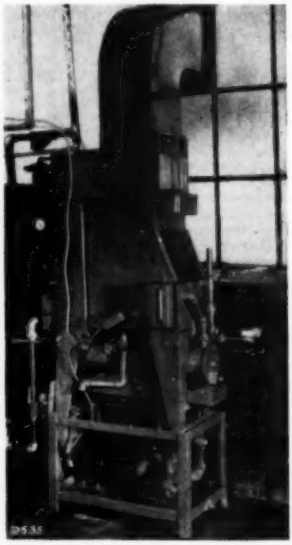
Write To—

SYNTRON COMPANY
425 Lexington Avenue Homer City, Penna.

be lapped, the pneumatic lift attachment will speed production by facilitating loading and removal of parts and workholders. Each conditioning ring and pressure plate unit is individually raised by a pneumatic lift. When the automatic lapping cycle stops, each lift is raised by pneumatic pressure.

### 51—LIQUID SPRAY PREVENTS FROSTING

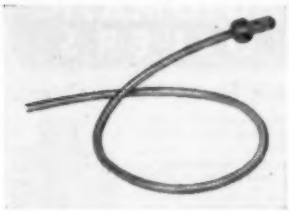
The Niagara Blower Co. has introduced equipment that consists of the Niagara spray cooler, which provides a controlled cold air stream at sub-zero temperatures. Air passes over refrigerated coils that are prevented from accumulating ice or frost by a



constant spray of a non-freezing liquid. The unit permits refrigeration to temperatures as low as —30 F without interruption for defrosting. From this point additional refrigerant coils may be used to obtain extreme low temperatures. There is no loss of effectiveness common to refrigeration systems where frost progressively accumulates on the refrigerant coils. These concentrators will be manufactured in a wide range of sizes with water evaporating capacities ranging from ½ to 75 gal per hr. A single large concentrator will serve a battery of several large spray coolers.

## 52—SCANNER GIVES FLAME PROTECTION

Combustion Control Corp. announces a series of flame failure safeguards and programming controls. Series FP control is a



photoelectric flame failure safeguard, which can "see" all types of flames—gas, oil, pulverized coal—and protects against the hazard of explosion. The scanner is a tube that gives instantaneous and positive response to flame failure. Compact scanner is installed in a short length of ½ in. standard pipe located where its sensitive cell can scan the flame area. It replaces both flame rod and photoelectric scanner, reducing installation and servicing problems to the absolute minimum.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

## 53—ENGINE COOLING WATER FILTER

The Austin Engineering and Mfg. Co. now manufactures an all purpose filter for cooling systems adaptable to radiators and internal combustion engines. Standard sizes are made for cooling systems of 6, 12, 25,

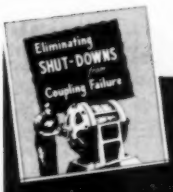
50, 100, 150 and 200 gal capacity. Special sizes are designed for larger cooling units.

The water filter uses a replaceable cotton element that is treated with a vegetable compound which goes into solution immediately. This treated water protects and corrects against scale and rust. The units are positive in action.


# FOR PROVEN COUPLING SERVICE ON

**WALDRON**
*Improved*
**Gear Type**

**From every standpoint—design, construction, operating features—these WALDRON Couplings give greater assurance of longer, trouble-free service. No other coupling has so many major construction features for greater operating advantages. An examination of its many design refinements will quickly explain why the WALDRON coupling is so consistently specified for all types of applications where dependability of performance is a first essential.**




*Write for this Helpful Folder*
explaining coupling features which give added insurance against coupling failure. No obligation.

**JOHN WALDRON**
CORPORATION
New Brunswick, New Jersey
*Authorized Sales Representatives in Principal Cities*

ONE MAN and a *Silent Hoist* electric-driven Car Puller can pull and spot cars . . . warp barges . . . drag pallet or skid loads, logs, quarry stone, heavy equipment . . . bend pipe . . . open hopper doors . . . etc. . . . and Cut Your Materials-Handling Costs!

*SOME TYPICAL USERS:* Armstrong Cork Co.; Bethlehem Steel; Cross, Austin & Ireland; Great Northern Rwy; Johns Manville; Hercules Powder; NYC RR; Nicholson File Co.; Rochester Gas & Elec.; Socony-Vacuum Oil, etc.

*Write for Bulletin No. 64A*

*Mfrs. of KRANE KAR Swing-Boom Mobile Cranes . . . Heavy-Duty Fork LIFTRUK . . . Cranes for Motor Trucks . . . Capstans, Gypsies, Single and Double Drum Winches.*

**SILENT HOIST & CRANE CO.**

856 63rd Street, Brooklyn 20, N. Y.

*Modern Accurate Dependable*

TRICO **AUTOMATIC OILERS**

**Repay Their Cost Many Times Over!**

- Productive man-power is released for other, more profitable duties.
- Down-time for "trust-to-luck", wasteful hand oiling is eliminated.
- Costly bearing failures are reduced to a minimum.
- Machine life is greatly prolonged.
- Fire and accident hazards are eliminated.

Eliminate the old, wasteful and dangerous "trust-to-luck", daily hand oiling methods . . . Remember, one filling of TRICO oilers lasts a long time and provides perfect, constant, bearing protection at all times. Switch to TRICO Oilers now . . . They are quickly and easily installed. There's a type and size for every application.

**WRITE FOR YOUR FREE OILER CATALOG**

**Speed Up Fuse Replacement With TRICO**

**FUSE PULLERS**

Write for Free Bulletin No. 5.

Prevent burns, shocks, serious infection and compensation costs. Also handy for adjusting switch and fuse clips. Every electrician should carry one . . . Hang one at at every fuse box.

TRICO FUSE MFG. CO. Milwaukee, Wis.

*"LIQUIDS WORTH STORING ARE WORTH MEASURING"* with a

**LIQUIDOMETER** *Tank Gauge*

- FOR GAUGING LIQUIDS OF ALL KINDS
- 100% AUTOMATIC
- APPROVED BY UNDERWRITERS' LABORATORIES

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THE **LIQUIDOMETER** CORP.

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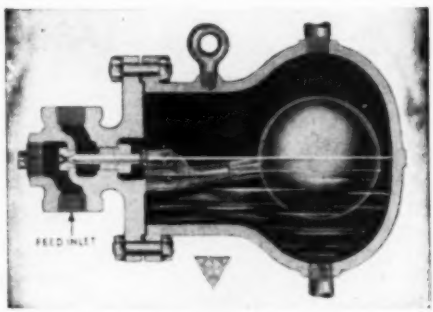


**you get *plus-value* with STETS Type G Regulators**

Valve-in-end construction gives you simple, compact design that's built for maximum performance. You can get STETS Type G regulators in either piston or orifice valve units—250-400 w. s. p.—other types to 900#.

Write today for bulletin 150 with full facts on the STETS new LPG Regulator, 5-75 w. s. p.

**STETS COMPANY**

1440 BROADWAY — NEW YORK 18, N. Y.

# NEW BULLETINS

*( Continued from page 31 )*

### INSTRUMENTS, CONTROLS, RECORDERS

**232—Synchronous Motor Controls.** Polarized field frequency controls (standard interrupting capacity type) for synchronous motors are covered in 8-page bulletin 3100-PRD-204. Illustrates and describes in detail all the standard types for full-voltage, reduced-voltage, and part-winding starting. Also replete with helpful data including ratings, weights, dimension drawings, wiring diagrams, layout drawings, and specifications for each type of control that is covered. The Electric Machinery Mfg. Co.

**233—Air-Operated Combustion Control.** Fundamental principles of automatic combustion control and their application to boilers fired with fuels burned in suspension or fired with stokers are discussed in 16-page bulletin 102E. Diagrammatic layouts of both applications are included along with photos and full descriptions of the instruments needed. Bailey Meter Co.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

**234—Regulators & Valves.** Catalog 51 contains 56 pages of illustrations and engineering data on steam and liquid control equipment. Drawings, layout diagrams, dimensions and capacity tables pertaining to pressure regulators, temperature regulators, float valves, water gages, float boxes, safety and relief valves, strainers, etc., are included. O. C. Keckley Co.

**235—Control Centers.** Economical, safe and convenient are some of the adjectives used describing centralized control centers in 4-page bulletin 4410. Informative booklet shows by words and pictures just what Multitrol units are; and why and how to use them. Gives specifications for typical Multitrol control center. Ward Leonard Electric Co.

**236—Industrial Instruments.** Here are 56 pages of the latest information on temperature and pressure instruments. Catalog 101-J contains complete data on industrial thermometers, hydrometers, pressure gages and regulators, and other products. Photos and drawings illustrate items. H. O. Trerice Co.

### BULK HANDLING EQUIPMENT

**237—Magnetic Separators.** "Facts about Permanent Magnetic Separators" tells the purpose of magnetic separation and then proceeds to give you case studies in practically every industry. Another 8-page catalog, No. 12, discusses features and shows various

BOILERS ARE SAVED BY KNOWING
THE WATER LEVEL.
Some operators have to guess.
Some need a telescope to see
the gage glass from the floor.
Others have to be satisfied with
an approximation.
BUT .....
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+8
+6
+4
+2
—N—
-2
-4
-6
-8
-10
L
TRUSCALE
You KNOW
The Water Level
When you have a
JERGUSON
TRUSCALE
GAGE
THE Jerguson Truscale Gage for remote reading of boiler and other liquid levels is ACCURATE to ½ of 1% of scale reading.
It is DEPENDABLE, for it works on hydrostatic heads directly from the boiler drum. Simple in design, with magnet external to manometer system, and featherlight pointer system. All internal moving parts of stainless steel; no stuffing boxes.
Models for any pressure and range; illuminated dial; scale markings and pointer glow in the dark.
Model ±2 duplicates water level as shown in gage glass at boiler
Available with visible and audible alarms at auxiliary points
Marine Operators: Special installation procedure compensates for roll and pitch of your ship.
Write for full information on Jerguson Truscale Gages
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**Problems in WATER TREATMENT are rightly solved when you call in the RIGHT ANSWER people. Refinite's Sales & Service Staff blankets the nation, and there is a representative close enough to give you neighborly service. Merely get in touch with Norm Tucker at Refinite in Omaha. He will have the Refinite man nearest you get the necessary details concerning your problem, and forward to the RIGHT ANSWER Service in Omaha . . . for immediate attention.**

*Today . . . ask the girl on the switchboard to get Norm Tucker of RIGHT ANSWER Service . . . ORchard 3000 . . . Omaha. Or, write. Address: Right Answer Service, Refinite Corp., P. O. Box 1312, Omaha, Nebraska.*

**Refinite**
**WATER REFINING EQUIPMENT**
**OMAHA, NEBRASKA**

**NO SCORE for centrifugals in any inning . . . when you pack with PALMETTO PALCO®!**

On centrifugals pumping water or handling any neutral fluid to 275 F, there's no chance of scoring pump sleeves if the packing is Palmetto Palco.

Palco won't score because it can't score. Built of cotton roving, each strand is separately saturated with a Palmetto lubricant that provides a *self-lubricating* packing. Friction created is negligible.

Available in coil or ring . . . plaited square to required sizes. Write today for full particulars on this and the full line of Palmetto packings for all industry.

**GREENE, TWEED & CO.**
**NORTH WALES, PENNSYLVANIA**

***Contact your fully-stocked Palmetto distributor on all packing problems . . . ask him about our special tools.***


models suitable for almost every application. Capacity and dimension tables are included as are diagrams showing how different types perform. Eriez Mfg. Co.

**238—Coal Handling.** Modern central station coal-handling practices as portrayed by recent installations are given in 20-page bulletin. Illustrates individual units of equipment along with diagrams, dimensional drawings, etc. The C. O. Bartlett & Snow Co.

**239—Coal Storage.** Entitled "Economic Coal Storage", 8-page educational booklet is suited as a training aid on safe, orderly coal-handling methods. Teaches how to store coal with the most flexible type of equipment at low operating cost. Allis-Chalmers Manufacturing Co.

**240—Coal Crushers & Pulverizers.** Facts about efficient coal preparation for power plants are presented in 8-page bulletin. Shows how coal is split, not crushed, thereby offering improved combustion and reduced ash-pit loss through uniform coal sizing. Speed, capacity, horsepower, weight and dimensions of the units are listed in convenient tables. American Pulverizer Co.

**For more information use one of the convenient reply cards on page 117. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you**

**241—Ash-Handling Systems.** This company's approach to the ash-handling problem is presented in 20-page brochure. Although it advises that specific problems are better solved by an engineering discussion, various schemes are briefly described. Basic arrangements and advantages of Hydrojet systems are given descriptively and diagrammatically. Detailed information on operating and construction advantages is contained together with cutaway views and photographs that show the equipment at work. Allen-Sherman-Hoff Co.

## POWER TRANSMISSION

**242—Adjustable-Speed Calender Drives.** Bulletin GEA-5588 deals with adjustable-speed drives for calendering rubber, plastics and similar materials. Illustrated by nineteen photographs and a series of charts and diagrams, the 8-page booklet outlines the uses and advantages of the electronically-regulated drives. Includes dimensions and hp ratings of all G-E calender drive motors and motor-generator sets. General Electric Co.

**243—Gear Coupling.** Spline or gear type coupling designed to handle shaft misalignment up to 7 degrees is the subject of 6-page bulletin. Drawings and cutaway views show how the dihedral surfaces of gears provide maximum bearing area and handle maximum misalignment with minimum clearance on backlash. Selection table makes it easy to choose the correct size coupling. Recommended applications

are listed and engineering service for special installations is offered. Ajax Flexible Coupling Co., Inc.

**244—Roller Chain Flexible Couplings.** Engineering information for proper application of roller chain flexible shaft couplings is given in 4-page folder. Includes dimensions, weights, service factors, and hp ratings. Shows examples of coupling selection and gives detailed data on two types of protective grease-retaining casings. Link Belt Co.

**245—Variable-Speed Drive.** All-metal variable-speed transmission with six outstanding features is presented in 8-page bulletin. Discusses the principle of operation and tells how all speeds to zero and reverse are obtained. Engineering data are diagrammed and charted, and specifications are tabulated. Available in standard and geared-head types with built-in or coupled motor. Wide choice of controls is offered. Graham Transmissions Inc.

**246—Oil-Field Chains.** Detailed presentation of riveted oil-field assembly is given in illustrated bulletin. Assembly provides the strength, long life and lower cost of riveted roller chain plus easy assembly and disassembly. Also included in the book is a description of oil-field chains including offset sidebar roller chains and A.P.I. chains. Roller chain couplings and sprockets are described and other oil-fired equipment is shown. Chain Belt Co.

**247—Couplings.** Piloted couplings that support a long shaft extension or floating shaft are illustrated and described in 6-page folder. Photos, drawings and diagrams show how units provide axial and torsional flexing action. Selection and dimension tables are included. The Falk Corp.

**248—Tension Linkage.** "Tension Linkage" as used in informative handbook describes any chain application in which linear movement of the chain is not continuous in direction. The predominating feature of tension linkage is that the chain need not be an endless belt. Numerous example of tension linkages are shown and described in this bulletin. Various types of roller chains used in tension linkage applications are illustrated and described. Chain Belt Co.

### PUMPS AND ACCESSORIES

**249—Horizontal Centrifugal Pumps.** General utility Fluidyne pumps are the the horizontal, end-suction centrifugal type and are available in a capacity range from 10 to 5500 gpm with heads to 260 ft. Bulletin B-2300 tells the whole story in 24-pages. Contains descriptive matter pertaining to features, application data, and construction details along with photographs, diagrams, tables and selection charts. Peerless Pump Div. Food Machinery Corp.

**250—Packings & Gaskets.** Feature of 100-page loose-leaf catalog is the use of illustrations sufficiently large to show actual cross-sections of many items described. Three pages are devoted to charts showing recommendations for


# You Get Trustworthy Liquid or Gas Cooling With Great Cooling Water Savings from the NIAGARA AERO HEAT EXCHANGER

● You can cool air, gas, water, oils, chemicals, electric and power and process equipment, engines, mechanical processes with lower cost and really accurate, control of temperature with the Niagara Aero Heat Exchanger.

You are assured of uniform, constant production and quality from any process . . . steady, reliable operation . . . lower cost for more dependable cooling. You can have closed system cooling with freedom from scale, dirt, corrosion and maintenance troubles. You can accurately cool more than one type of liquid with one machine.

The Niagara Aero Heat Exchanger uses atmospheric air to cool liquids and gases by evaporative cooling. You can remove heat at the rate of input to keep accurate control of gas or liquid temperature. You can put heat back into the system to save the losses of a "warm-up" period or to equalize the effect of load variations.

Great savings in cooling water and savings in piping, pumping and power return the cost to you quickly. The Niagara Aero Heat Exchanger can save you approximately 95% of your cooling water cost. Write for Bulletin 96.

**NIAGARA BLOWER COMPANY**

Over 35 Years Service in Industrial Air Engineering

**Dept. IP, 405 Lexington Ave.** **New York 17, N. Y.**

*Experienced District Engineers in all Principal Cities*

packing various types of equipment. Another 8-page section provides engineering data on common causes for packing failure; advantages of Lantern glands; suggested procedure for proper installation of packings; fahrenheit and centigrade conversion table; and other worthwhile information. Products made of Teflon also are described and illustrated. Packing Div. Raybestos-Manhattan, Inc.

**251—Centrifugal Pumps.** Latest developments in a line of single stage, split case centrifugal pumps are covered in bulletin 5004-A. Pumps shown in 8-page booklet are furnished for direct connection to electric motors, steam turbine, gasoline engines, or with belt drive from any source of power. Vari-colored table simplifies pump selection to meet specific requirements for capacity and head. Capacities range from 25 to 4000 gpm with total heads from 20 to 300 ft. Illustrations of construction elements and detailed specifications including dimension tables are shown. The Deming Co.

**252—Centrifugal Pumps.** Pump and engine designed and built as integral unit is presented in 4-page bulletin. Gives actual test figures on various models along with specifications. Capacity to 160 gpm. W. S. Darley & Co.

### TOOLS AND SPECIALTIES

**253—Industrial Vacuum Cleaners.** In addition to conveying, collecting, reclaiming, sanitation, and water pick-up, over 100 other uses are claimed in Spencer's bulletin 125D. Photographs show how to use the various tools. Portable cleaners and stationary systems are illustrated and described. The Spencer Turbine Co.

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**254—Steel Castings.** Intended primarily as a guide for engineers, 34-page illustrated booklet uses case history examples to demonstrate the versatility, strength and dependability of steel castings. Emphasis is put on economies of production, together with adaptability to complex design requirements. Lists seven reasons why virtually all types of manufacturing industries are making increased use of steel castings. Steel Founders' Society of America.

**255—Brushes.** Industrial brushing operations are fully covered in 76-page catalog designed to simplify selection of the best brush for the individual job. Photographs of brushes in actual use show various types of brushing setups. Section is devoted to factors involved in selecting the right unit for specific applications; also, operating equipment requirements, brush characteristics, operating conditions, surface speeds and other helpful information. The Osborn Mfg. Co.

### VALVES, PIPING AND FITTINGS

**256—Welding End Specifications Table.** Handy reference table, developed from specifications gathered from various sources contains, in addition to standard dimensions, diagrams of straight bevels for pipe wall thicknesses of ¾ in. and less. Also includes diagrams of U-bevels for pipe wall thicknesses over ¾ in. Edward Valves, Inc.

**257—Valves.** Catalog 104 gives a comprehensive picture of the current line of Edward cast and forged steel valves. The 28-page bulletin gives design detail, dimensional data and material specifications. Edward Valves, Inc.

**258—Pipe Hangers—Sway Braces.** Complete line of non-resonant variable-support hangers and sway braces are shown in 8-page catalog 502. Having damping features incorporated in their design, the supports cannot go into resonance with the supported piping, it is claimed. Booklet contains load-deflection charts, along with dimensions and components diagrams and tables. Bergen Genspring Corp.

**259—Fluid Line Couplings.** Advantages of standardizing are explained in 38-page catalog that covers quick-connective couplings for fluid line connections. Contains complete information, engineering data, dimensions, etc., on


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There is not a pin, not a bearing, not a link, nor a lever to wear in these Nicholson expansion steam traps. The valve is the only moving part. This extreme simplicity is resulting in record low maintenance costs.

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such types as straight-through, one-way shut-off, two-way shut-off, or special service couplings for steam, oxygen, acetylene, gasoline, etc. The Hansen Mfg. Co.

**260—Expansion Joints.** Bulletin 351 gives sizes, dimensions, suggested applications and other technical data on a variety of joints from small flexible connectors for use on diesel exhaust lines to 30-ft dia joints. Zallea Brothers.

**261—Hi-Temperature, Hi-Pressure Tubing Steels.** Technical information valuable to engineers concerned with tubing used in elevated temperature and high pressure applications is contained in 6-page bulletin 12F. Contains such information as analyses, physical and mechanical properties, creep strength, short time elevated temperature tensile strength, and oxidation resistance of 14 of the more popular tubing steels. The Babcock & Wilcox Tube Co.

**262—Stainless Tubing.** Technical data are offered in 4-page bulletin 19. Gives condensed data on analyses, oxidation resistance, thermal treatment, and mechanical, electrical and physical properties on ten of the austenitic and ferritic stainless tubing steels. The Babcock & Wilcox Tube Co.

**263—Duplex Tubing.** The problem of inside and outside attack by two different types of corrosive media may be solved by using duplex tubing. Technical bulletin 1950 gives you 12 pages of informative data on the application of duplex tubing in various industries. Methods of installing are described along with diagrams showing how it's done. Includes questionnaire to aid in deciding which metals should be used to combat double corrosion. Bridgeport Brass Co.

**264—Corrosion-Resistant Fittings.** Corrosion-resistant fittings are described in 8-page booklet. In addition to describing low cost fittings, for which patents are pending, the book shows how light-walled corrosion-resistant piping reduces the cost of a typical layout. Horace T. Potts Co.

**265—Revolving Joints.** Rotary seals designed for steam or cold service, generally in excess of 25 to 50 rpm up to 2500 rpm in some models, are presented in Barco's 8-page catalog 300. General features, dimensions along with installation and lubrication suggestions are given. Includes diagrams illustrating typical installations for both the single flow and the syphon styles. Briefly describes flexible, swivel and swing joints and mentions catalogs covering these types. Barco Mfg. Co.

**266—Manual Valves.** Shut-off, selector and manipulator valves for pressures to 6000 psi are covered in 46-page catalog. Contains explanations and illustrations of the Shear-Seal principle. Included is simple outline for determining proper valve size with tables giving steel pipe data and capacities of hydraulic rams. Barksdale Valves.

**267—Cast-Steel Alloys.** Two comprehensive brochures describe cast steels and copper base alloys, which will help solve your piping problems and enable you to conserve critical materials by getting maximum service from your equipment. This new metallurgical information deals with the basic problems of metal soundness, porosity, welding, graphitization, creep strength, new alloys, code conformance and other subjects. It is the result of years of research. The Lunkenheimer Co.

**268—Venturi-Ball Valve.** Cardboard working model demonstrates unique action of venturi-ball valve. Said to provide accurate control at all positions from wide-open to tight-shut. Model also illustrates (1) straight-through flow with the valve wide open, (2) non-turbulent chatterless throttling, and (3) drop-tight dead-end shut-off. Paul Valve Corp.

**269—Piping Engineer's Dimensional Data Card.** Dimensions on welding fittings and flanges that could otherwise be found only by searching through many catalogs and tables have been condensed to page-size card. One side covers line of welding fittings. Shows wall thickness and the essential dimensions for all types of fittings from ½ through 30 in. Other side shows forged steel flanges. Dimensions and


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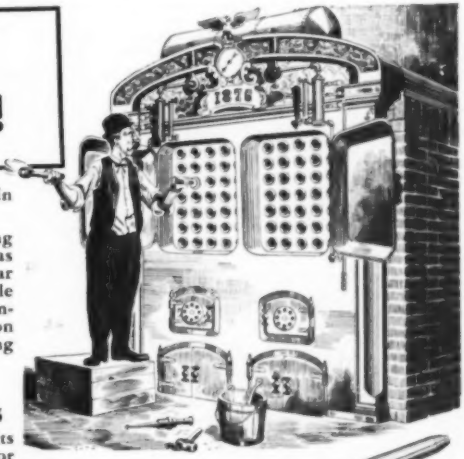

When boilers wore bustles, Egbert had his troubles. Leaking boiler tubes lost water and steam, so he had a constant battle to keep tubes tight. With rolled-up sleeves and a frown on his face, Egbert hammered the mandrel and turned it with a pin... hammered and turned until he was as beaten and battered as the mandrels.

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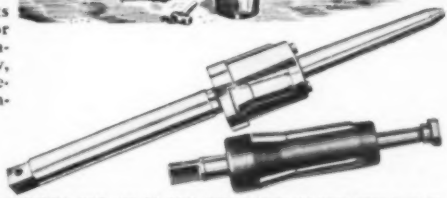

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bolting data are given for all types and weights from ½ through 24 in. Other useful information for piping engineers also given. Taylor Forge & Pipe Works.

**270—Automatic Valves.** Automatic reseating relief valve, large size pressure-reducing and regulating valve are described along with a cross-section of entire line of valves suitable for industrial application. Great many changes in construction are discussed, having come about as the result of extensive research. Of particular interest is the information outlining the steps necessary to order pressure-reducing and regulating valves. A. W. Cash Valve Mfg. Corp.

**271—Steam Traps.** Revised edition of "Solving Steam Trap Problems" contains 36-pages of helpful, practical information for engineers and maintenance men concerned with specifying, installing and servicing steam traps. Complete specifications and capacities on steam traps, float traps, air release valves and pipe line strainers are given. Describes how to calculate condensation loads and select traps for all classes of equipment. Gives pointers on how to install traps with the fewest fittings and how to service traps quickly and efficiently. Well illustrated with installation photographs and sketches showing typical arrangements, and construction. V. D. Anderson Co.

**272—Metal Bellows.** Information in 20-page catalog will help you determine

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**273—Non-return Valve.** Cushioned single-acting non-return valve is fully described in 6-page bulletin. Adaptability, testing, construction, installation, sequence of operation, servicing and specifications are covered in detail. Detailed drawings show three different yoke assemblies on elbow, angle and globe bodies. Golden-Anderson Valve Specialty Co.

**274—Chromium Stainless Steel Tubing.** Current restrictions on the use of nickel in steel have forced engineers to investigate the use of straight-chormium stainless steel. Four-page bulletin outlining the physical and mechanical characteristics of three non-hardening straight-chromium stainless tubing steel may assist in solving the problem. Included are technical data on analyses, creep strength, forging, forming, machining, welding and heat-treatment. Babcock & Wilcox Tube Co.

**275—Expansion Joints.** Designs and construction features of Yarway's Gun-Pakt and Glan-Pakt expansion joints are covered in 16-page bulletin. Packed with useful information. Tells you how to figure expansion of pipe lines, size, capacity and pressure loss of steam lines. Data on anchors for pipe lines also included. Gives 14 illustrations of typical expansion joint installations. Yarnall-Waring Co.

**276—Steam Traps.** Inverted bucket traps combine large capacities with very rapid discharge of condensate, practically at steam temperature, according to 4-page bulletin. Describes low, medium and high pressure units to 900 psi. Operating principle, features, dimensions and capacities are all listed along with cutaway views showing operation of the traps. Sarco Co., Inc.

**277—Flange Design Manual.** Third edition of 50-page manual reflects current thinking on the subject of flange design and brings to the designer a wider scope of practical suggestions and discussion aimed at increasing his understanding of the subject. Presents latest data and demonstrates calculations required. Flange formulas together with related data on bolting, gaskets, etc., are given in convenient form. Charts, tables and diagrams are included. Taylor Forge & Pipe Works.

## HEATING, VENTILATING AND AIR CONDITIONING

**278—Unit Heaters.** Gas-fired unit heaters in sizes ranging from 70,000 to 230,000 Btu per hr are described in 30-page bulletin 7117. Gives design features along with application and installation instructions. Maintenance suggestions are conveniently placed with repair parts list. Six tables cover ratings, physical data, capacity of gas pipes, resistance of elbows, gas consumption of units, and drill sizes of orifices and burner ports. American Blower Corp.

**279—Blowers.** Low, medium and high capacity Standardaire blowers are covered, in 6-page bulletin 88. Contains dimensional information including engineering layout, typical application data, design data, and rating—cfm at listed rpm. Drawing points out ten accessories and photos illustrate several models. The Standard Stoker Co.

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**280—Space Heaters.** Gas or oil direct-fired space heaters with outputs from 400,000 to 2,000,000 Btu per hr are presented in 8-page bulletin. Gives 30 reasons why Counterflo heaters are the least expensive and most efficient for open-space heating. Construction features, applications and installation data are included. Dravo Corp.

**281—Industrial Air Conditioning Guide.** Planning guide, in which all technical information has been reduced to understandable every-day terms, gives the whole story on industrial air conditioning. Explains the five vital


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functions a system should perform and tells you what to expect along with factors to consider when planning a system. Details and features of different types of equipment together with illustrations showing the units in operation are given. Booklet B-5160, 20 pages. Westinghouse Electric Corp. Sturtevant Div.

**282—Dust Collectors.** Dust is collected either to minimize a nuisance or for the value of the material collected. Bulletin 1428 gives you a picture story of the American Blower facilities for testing, designing and building dust collecting equipment. American Blower Corp.

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**283—Fans & Blowers.** Crammed full of factual information, this 64-page booklet should help you solve any sort of air-handling problem. Five pages of engineering data along with chapters on research and testing, certified fan ratings, propeller progress and development, installation, operation and maintenance, and motor data are given. Numerous tables, charts and diagrams present data in convenient form. Six pages of typical installations round out the booklet. Hartzell Propeller Fan Co.

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## MISCELLANEOUS

**284—Industrial Waste Incinerators.** Efficient incinerators are recognized necessities for industrial plants. Catalog 35-J-41 gives you full description along with illustrations on extensive line of incinerators designed to burn any type of wet or dry waste. Includes tables which give capacities for standard sizes and models, in addition to survey sheet that enables Plibrico engineers to recommend types and sizes best suited to your needs. For existing incinerators there are three pages of information on such accessories as overfire air jet system, and castable refractory for lining stacks, flues and breechings. Plibrico Jointless Firebrick Co.

**285—Heat Transfer Equipment.** Condensed 4-page catalog 10 shows representative items in heat transfer equipment. Actually is an illustrated index of P-K equipment with catalog details offered. Patterson-Kelley Co., Inc.

**286—Planned Lighting.** Bulletin LD-4 is a comprehensive 47-page publication titled "Planned Lighting For Industry". Profusely illustrated, it outlines the benefits of good industrial lighting; then describes how to engineer lighting to various industrial tasks. Discusses six principal lighting systems and the use of specific techniques for special needs. Sections are devoted to protective lighting; wiring for the lighting system; and maintaining the lighting system. General Electric Co.

**287—Foundation Structures.** Types and applications of foundation structures, pressure grouting, drainage, de-watering, shoring and sub-surface soil exploration are illlustrated and described in 24-page brochure. Includes valuable tables prepared for the assistance of engineers in figuring drilled and poured foundation piling and caissons. Of particular interest are tables on volume of different diameter caisson bells in relation to various size shafts. Casey & Case Foundation Co.

**288—Dust Recovery.** Folder C-117 describes installations of equipment made in various dust-recovery applications. Although the bulletin particularly features applications in cement, stone and rock crushing plants, much of the data is also of interest to those in other industries where dust recovery problems are present. Weston Precipitation Corp.

**289—Chain Drive Handbook.** Helpful information for engineers and maintenance men is contained in new handbook and catalog. Packed with suggestions on how to install, maintain and operate roller chain. Tells how to plan chain drive layouts and offers hints on lubrication and roller chain selection. Also includes length conversion tables, hp rating charts, and specifications for all types of roller chain and extended pitch conveyor chain. Catalog ARC-51-PR. Atlas Chain & Manufacturing Co.

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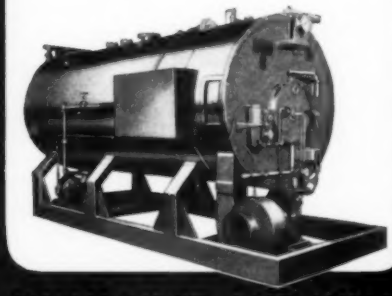

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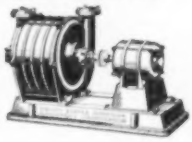

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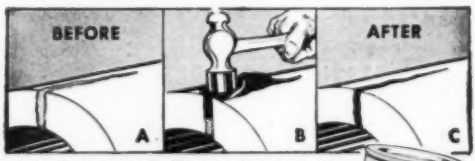


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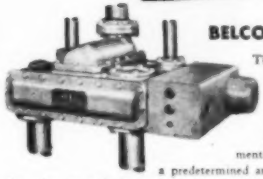

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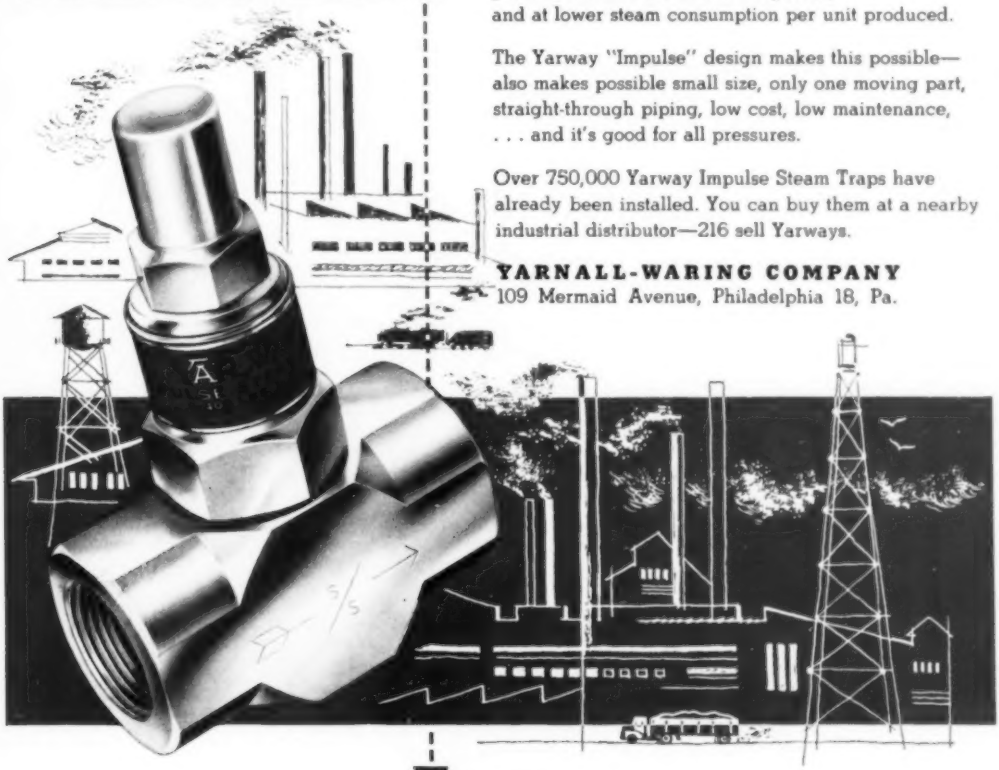

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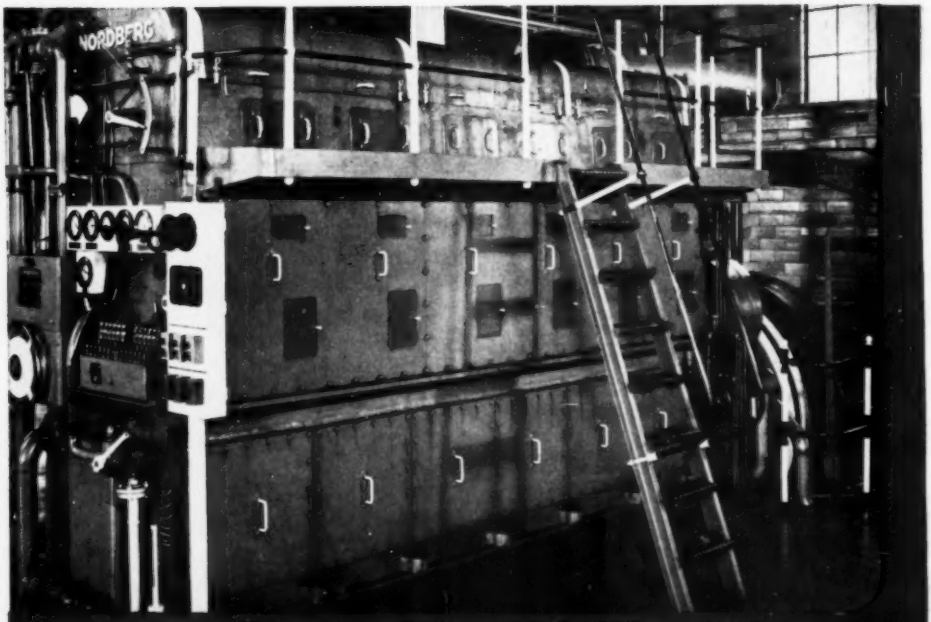


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